Proposal

Of

the Investor/Promoter to Make Investment

in

THE REPUBLIC OF UNION OF MYANMAR

The Proposal Form of Investor/Promoter for the Investment to be made in the Republic of the Union of Myanmar

To

Chairman
Myanmar Investment Commission

Letter No. 822/CNHC/DEPP/2017
Date: 16th October, 2017

I do apply for the permission to make investment in the Republic of the Union of Myanmar in the CHIPWI NGE Project for developing the hydropower resources of Maykha, Malikha and upstream of Ayeyawady-Myitsone River basins in the Republic of the Union of Myanmar in accordance with the Myanmar Investment Law by furnishing the following particulars:

1. The Investor's or Promoter's:

(a) Name: Daw Mi Mi Khaing
(b) Father's name: U Hla Myint
(c) ID No./National Registration Card No./Passport No. : 12/SaKhana (Naing) 039523
(d) Citizenship: Myanmar
(e) Address
(i) Address in Myanmar:
No.506(B), Zeya Theikdi Quater, Zabuthiri Township, Nay Pyi Taw
(ii) Residence abroad
(f) Phone/Fax: +95(67)411577, +95(9)8600133
(g) E -mail address: depmmk@gmail.com
(h) Name of principle organization:
Department of Electric Power Planning (DEPP) under the Ministry of Electricity and Energy
(i) Type of Business: Planning for Hydropower Development and Implementation
(j) Place of organization: Office No.6 Nay Pyi Taw

2. If the investment business is formed under Joint Venture, partners':

(1) Particulars of the first partner
(a) Name: Mr. Li Guanghua
(b) Father's name: Mr. Li Zhengqi
(c) ID No./ National Registration Card No./Passport No.: P01655035
(d) Citizenship: The People's Republic of China

(e) Address

(i) Address in Myanmar

(ii) Residence abroad: Dianchi Rd. No. 1302, Kunming, Yunnan, P.R. China

(f) Parent company: CPI Yunnan International Power Investment Co., Ltd

(g) Parent company's address: Dianchi Rd. No. 1302, Kunming, Yunnan, P.R. China

(2) Particulars of the second partner

(a) Name: U Zaw Win

(b) Father's name: U Nyunt Maung

(c) ID No./ National Registration Card No./Passport No.: 13/LAYANA(NAING)029236

(d) Citizenship: Myanmar

(e) Address

(i) Address in Myanmar: Between 63x 64 St, Mandalay

(ii) Residence abroad

(f) Parent company: Royal Victory Services Company Limited

(g) Parent company's address: No(80), Boaungkyaw Road, Low Block, Botataung, Yangon Myanmar

Note: The following documents need to be attached according to the above paragraph (1) and (2):-

(1) Company registration certificate (copy); (*Please refer to Attachment 2*)

(2) National Registration Card (copy) and Passport (copy); (*Please refer to Attachment 3*)

(3) Evidences about the business and financial conditions of the participants of the proposed investment business. (*Please refer to Attachment 4*)

3. Type of proposed investment business:

(a) Production: ELECTRICITY (599 million kWh per year)

(b) Installed Capacity: **99 (3×33) MW**

(c) Services: All the project facilities and auxiliary facilities will be transferred to DEPP after expiration of the project concession period (40 years commencing from the date of commercial operation of the CHIPWI NGE project for the benefits of the local people).

4. Type of business organization to be formed: Joint Venture (*Please refer to Attachment 5 for the JV agreement and Attachment 6 for the deed of assignment*)

5. List of shareholders

No.	Name of Shareholder	Citizenship	Share Percentage
1	Department of Electric Power Planning (DEPP) under the Ministry of Electricity and Energy	Myanmar	15%
2	CPI Yunnan International Power Investment Co., Ltd. (CPIYN)	China	80%
3	Royal Victory Services Limited (RVS)	Myanmar	5%

6. Particulars of Company incorporation

(a) Authorized capital: USD 1,000,000.00 (RMB 6,152,000) ;

(b) Types of shares: 10,000 Ordinary Share

(c) Number of Shares:

Share capital to be subscribed by the shareholders DEPP 0%;

CPIYN 94.12%;

RVS 5.88 %

Note: Memorandum of Association and Articles of Association of the Company shall be submitted with regard to above paragraph 6. (*Please refer to Attachment 5*)

7. Particulars of Paid-up Capital of the investment business

(a) Amount/percentage of local capital to be contributed

DEPP 0%

USD 0 (RMB 0)

RVS 5.88%

USD 58,800 (RMB 361,738)

(b) Amount/percentage of foreign capital to be brought in

CPIYN 94.12%

USD 941,200 (RMB 5,790,262)

Total: USD1,000,000 (RMB 6,152,000)

(c) Annually or period of proposed capital to be brought in: 3 years (Estimated period to the COD)

(d) Value /Amount of investment: USD 242,387,176 (RMB 1,491,165,904)

(e) Investment period: 40+10years

(f) Construction /Preparation period: 4 years (Already constructed, from 2008 to 2011)

8. Detailed list of foreign capital to be brought in

		Foreign Currency	Equivalent Kyat
(a)	Foreign currency (Type and Value)		
(b)	Machinery and equipment (to enclose detailed list)*	USD 46,948,605 (RMB 288,827,820)	63,709,256,985
(c)	The value of initial raw materials and other similar materials (to enclose detailed list)*	USD 21,434,980 (RMB 131,868,000)	29,087,267,860
(d)	Value of license, intellectual property, industrial design, trade mark, patent, etc.		
(e)	Value of technical know-how		
(f)	Others(eg: Construction materials)	USD 174,003,590 (RMB 1,070,470,084)	236,122,871,630
	Total	USD 242,387,176 (RMB 1,491,165,904)	328,919,397,832

Remark: (1) Detailed list of machinery and equipment; (*Please refer to Attachment 7*)

(2) Detailed list of main raw materials. (*Please refer to Attachment 8*)

*Note: 1USD = 1357Kyats (when calculate the Equivalent Kyat)

9. Details of local capital to be contributed

		Kyat (Million)
(a)	Amount	
(b)	Value of machinery and equipment (to enclose the detailed list)	
(c)	Value or rental rate of land and buildings	
(d)	Cost of building construction	
(e)	Value of furniture and assets (to enclose the detailed list)	Supplied by DEPP free of charge
(f)	Value of initial raw material (to enclose the detailed list)	
(g)	Others	
	Total	

10. Particulars of Loans

Loan (local) kyat(s)

Loan (abroad): USD 169,671,023 (RMB 1,043,816,133)

11. Particulars about the Investment Business

(a) Investment location(s)/place: CHIPWI KHA River, 18 Km east of CHIPWI town, Kachin state, Myanmar.

(b) Type and area requirement for land or land and building

(i) Location: Chipwi town, Kachin state

(ii) Area and number of land/building: wasteland (220.17acre), farmland (2 acre)

(iii) Owner of the land

(aa) Name/company/department

(bb) National Registration Card No.

(cc) Address

(iv) Type of land: wasteland (220.17acre), farmland (2 acre)

(v) Period of land lease contract

(vi) Lease period From To ( ) year

(vii) Lease rate

(aa) Land

(bb) Building

(viii) Ward

(ix) Township

(x) State/Region

(xi) Lessee

(aa) Name/ Name of Company/ Department

(bb) Father's name

(cc) Citizenship

(dd) ID No./Passport No.

(ee) Residence Address

Note: The following documents have to be enclosed for above Paragraph 12 (b)

(i) to enclose land ownership and ownership evidences(except industrial zone) and land map; (*Please refer to Attachment 9*)

(c) Requirement of building to be constructed;

(i) Type / number of building: Dam, Intake, Headrace tunnel, inclined shaft, Power house, Operator camps and Warehouse.

(ii) Area: dam area of 8.1ha; transmission line 30ha, permanent land occupation is 7.6ha, temporary land occupation is 54.75ha.

(d) Annual products to be produced/ Services: Electricity charge income

(e) Annual electricity requirement: about 1.20 million kWh

(f) Annual requirement of water supply: 250,000 m^3

12. Detailed information about financial standing

(a) Name/company's name: CPI Yunnan International Power Investment Co., Ltd

(b) ID No./National Registration Card No./Passport No.: 530000000018574

(c) Bank Account No.: 2502046809100011187

Remark: To enclose bank statement from resident country or annual audit report of the principle company with regard to the above paragraph 12. (*Please refer to Attachment 4*)

13. List of personnel required for the proposed economic organization

(a) Local personnel required

Serial No.	Stage	Number
1	Construction	*Please refer to Attachment 10*
2	Operation and Maintenance	*Please refer to Attachment 10*

(b) Foreign experts and technicians required

Serial No.	Stage	Number
1	Construction	*Please refer to Attachment 10*
2	Operation and Maintenance	*Please refer to Attachment 10*

Total: *Please refer to Attachment 10*

Remark: -

(i) Recruitment of employees; (*Please refer to Attachment 10*)

(i) Social security and welfare arrangements for all employees. (*Please refer to Attachment 11*)

14. Particulars relating to economic justification

	Foreign Currency	Equivalent Estimated Kyat
(a) Annual income:	*Please refer to Attachment 12*	
(b) Annual expenditure:	*Please refer to Attachment 12*	
(c) Annual net profit:	*Please refer to Attachment 12*	
(d) Yearly investments:	*Please refer to Attachment 12*	
(e) Recoupment period:	*Please refer to Attachment 12*	
(f) Other benefits:	taxes and long-term ownership, develop the economy and industry of Myanmar, more foreign currency income	

15. Evaluation of environmental impact: (*Please refer to Attachment 13*)

16. Evaluation on social impact assessments: (*Please refer to Attachment 13*)

17. Power Purchase Agreement: (*Please refer to Attachment 14*)

Signature of the applicant

Name: Daw Mi Mi Khaing

Title: Director General

Department /Company: Department of Electric Power Planning

(Seal/Stamp)

Attachment List

No.	Name
1	Explanation of non-commercial nature to commercial nature of Chipwi Nge HPP
2	Company registration certificate
3	National registration card and passport
4	Promoter’s Profile
5	JV agreement (including Memorandum of Association and Articles of Association of the Company)
6	Deed of assignment
7	Detailed list of machinery and equipment
8	Detailed list of main raw materials
9	Land ownership evidences
10	Recruitment of employees
11	Social security and welfare program
12	Financial evaluation
13	Environmental Impact Report of Chipwi Nge HPP
14	Power Purchase Agreement
15	Pictures of Chipwi Nge HPP

ချီဖွေငယ် ရေအားလျှပ်စစ်စီမံကိန်းအား Non-Commercial Nature မှ Commercial Nature အဖြစ် ပြောင်းလဲဆောင်ရွက်ခဲ့ခြင်းအပေါ် ရှင်းလင်းချက်

၁။ ဧရာဝတီမြစ်ဆုံ-မြစ်ညာ၊ မြစ်ဝှမ်း ရေအားလျှပ်စစ်စီမံကိန်းများဖြစ်သည့် မြစ်ဆုံ၊ ချီဖွေ၊ လိုက်ဇာ၊ ဝူဆောက်၊ ခေါင်လံဖူး၊ ယီနန်၊ ဖီဇော စီမံကိန်း(၇)ခုအတွက် တည်ဆောက်ရေးသုံး ဓာတ်အားပေး စက်ရုံအဖြစ် တည်ဆောက်ရန် ချီဖွေငယ်ရေအားလျှပ်စစ်စီမံကိန်း (၉၉) မဂ္ဂါဝပ်အား Non-Commercial Nature ဖြင့် အကောင်အထည်ဖော်ဆောင်ရွက်ရန်အတွက် ယခင် အမှတ်(၁)လျှပ်စစ် စွမ်းအားဝန်ကြီးဌာန၊ ရေအားလျှပ်စစ်အကောင်အထည်ဖော်ရေးဦးစီးဌာနနှင့် China Power Investment Corporation တို့သည် စာချုပ်အမှတ် 68/DHPI-2007-2008 ကို (၂၇-၂-၂၀၀၈) ရက်နေ့တွင် လက်မှတ်ရေးထိုးဆောင်ရွက်ခဲ့ပါသည်။

၂။ ချီဖွေငယ် ရေအားလျှပ်စစ်စီမံကိန်းသည် (၁၀၀ %) ပြီးစီးပြီဖြစ်ပြီး လျှပ်စစ်ဓာတ်အားထုတ်လုပ် နိုင်ပြီဖြစ်သော်လည်း ဓာတ်အားရယူသုံးစွဲမည့် ဧရာဝတီမြစ်ဆုံ-မြစ်ညာ၊ မြစ်ဝှမ်း ရေအားလျှပ်စစ် စီမံကိန်း(၇)ခုအနက် မြစ်ဆုံစီမံကိန်းကို နိုင်ငံတော်သမ္မတ၏ လွှတ်တော်အသီးသီးသို့ ပေးပို့ခဲ့သော သဝဏ်လွှာအရ (၃၀-၉-၂၀၁၁) ရက်နေ့မှစ၍ ရပ်ဆိုင်းထားခဲ့ရပြီး အခြားစီမံကိန်း(၆)ခုမှာလည်း အကောင်အထည်ဖော်နိုင်မှုမရှိသေးခြင်းကြောင့် အဆိုပါစီမံကိန်းများအနေဖြင့် ချီဖွေငယ်စီမံကိန်းမှ ထွက်ရှိလာမည့် လျှပ်စစ်ဓာတ်အားများကို လက်ရှိအခြေအနေတွင် အသုံးပြုနိုင်သည့် အခြေအနေ မရှိသေးပါ။

၃။ ယင်းသို့သော အခြေအနေများကြောင့် ချီဖွေငယ်စီမံကိန်းမှ ထွက်ရှိလာမည့် လျှပ်စစ်ဓာတ်အား များကို ကချင်ပြည်နယ်အပါအဝင် နိုင်ငံတော်ဖွံ့ဖြိုးတိုးတက်ရေးလုပ်ငန်းများတွင် ထိရောက်စွာ အသုံးပြုနိုင်ရန်နှင့် စီးပွားဖြစ်ထုတ်လုပ်ရောင်းချနိုင်ရေးတို့အတွက် Non-Commercial Nature မှ Commercial Nature သို့ ပြောင်းလဲရန် လိုအပ်လာပါသည်။

၄။ ရေအားလျှပ်စစ်စီမံကိန်းများ အကောင်အထည်ဖော်ရေးဆိုင်ရာ လုပ်ထုံးလုပ်နည်းများအရ Commercial Nature အဖြစ် ဆောင်ရွက်မည်ဆိုပါက JV/BOT စနစ်ဖြင့် ဆောင်ရွက်ရမည်

ဖြစ်ပြီး လိုအပ်သည့် သဘောတူညီမှုစာချွန်လွှာ MOA နှင့် ဖက်စပ်သဘောတူစာချုပ် JVA တို့ အသီးသီးချုပ်ဆိုသွားရမည်ဖြစ်ပါသည်။

၅။ ချီဖွေငယ်စီမံကိန်းသည် ဧရာဝတီမြစ်ဆုံ-မြစ်ညာမြစ်ဝှမ်း ရေအားလျှပ်စစ်စီမံကိန်းအား အကောင်အထည်ဖော်မည့် တရုတ်နိုင်ငံအစိုးရပိုင် China Power Investment Corporation (CPI) က တည်ဆောက်ခဲ့သည့် စီမံကိန်းတစ်ခုဖြစ်ခြင်း၊ ထွက်ရှိလာမည့် လျှပ်စစ်ဓာတ်အားကို နိုင်ငံတော်ဖွံ့ဖြိုးတိုးတက်ရေးလုပ်ငန်းများအတွက် ဆောလျင်စွာအသုံးပြုနိုင်ရန် ရည်ရွယ်ခြင်းတို့ကြောင့် လျှပ်စစ်စွမ်းအားဝန်ကြီးဌာနနှင့် CPI တို့အကြား ဧရာဝတီမြစ်ဆုံ-မြစ်ညာမြစ်ဝှမ်း ရေအားလျှပ်စစ်စီမံကိန်း (၇)ခုဆိုင်ရာ ချုပ်ဆိုခဲ့ပြီးဖြစ်သော ထီးရိပ်သဖွယ်လွှမ်းမိုးသည့် Memorandum of Agreement(MOA) တွင် ချီဖွေငယ်စီမံကိန်းအား ထပ်မံထည့်သွင်း၍ စီမံကိန်း(၈)ခု ပါဝင်သည့် Amendment to Memorandum of Agreement (MOA) နှင့် ဖက်စပ်သဘောတူစာချုပ် JVA တို့အား ပြည်ထောင်စုအစိုးရအဖွဲ့၏ ခွင့်ပြုချက်ဖြင့် (၂၁-၁-၂၀၁၅) ရက်နေ့တွင် လက်မှတ်ရေးထိုးခဲ့ပါသည်။

၆။ ချီဖွေငယ် ရေအားလျှပ်စစ်စီမံကိန်း၏ စီမံကိန်းကုန်ကျစရိတ်အား (၃၁-၃-၂၀၁၄) ရက်နေ့အထိ တရုတ်ယွမ် (၁၃၂၉.၂၆) မီလီယံအဖြစ် ယခင် လျှပ်စစ်စွမ်းအားဝန်ကြီးဌာနမှ အတည်ပြုကြောင်း လျှပ်စစ်စွမ်းအားစီမံရေးဦးစီးဌာနမှ ကုမ္ပဏီသို့ (၉-၆-၂၀၁၅) ရက်နေ့တွင် အကြောင်းကြားခဲ့ပါသည်။

၇။ ချီဖွေငယ်စီမံကိန်းအား JV/BOT စနစ်ဖြင့် အကောင်အထည်ဖော်ဆောင်ရွက်ရန် ချုပ်ဆိုခဲ့သည့် ဖက်စပ်သဘောတူစာချုပ်၏ အပိုဒ်(၁၀.၅) တွင် **"The expenditure of the power station to be used until COD had been covered in the total project cost and the parties agreed that the project cost will be mutually reapproved by the parties if COD is confirmed whatever later or earlier than the end of the year 2017"** ဟု ဖော်ပြထားပါသည်။ အဆိုပါ ဖော်ပြချက်မှာ ဓာတ်အားပေးစက်ရုံစီးပွားဖြစ်လည်ပတ်သည့်နေ့ (Commercial Operation Date - COD) အထိ ဓာတ်အားပေးစက်ရုံအတွက် သုံးစွဲခဲ့သော အသုံးစရိတ်များကို

စီမံကိန်းကုန်ကျစရိတ် (Project Cost) တွင် ထည့်သွင်းပြီး ဓာတ်အားပေးစက်ရုံစီးပွားဖြစ်လည်ပတ်သည့်နေ့သည် ၂၀၁၇ ခုနှစ်၊ နှစ်ကုန်ထက်နောက်ကျသည်ဖြစ်စေ (သို့) စောသည်ဖြစ်စေ သတ်မှတ်ခဲ့လျှင်၊ စီမံကိန်းကုန်ကျစရိတ်အား နှစ်ဖက်ပြန်လည် အတည်ပြုကြမည်ဖြစ်ကြောင်းကို စာချုပ်ဝင်များက သဘောတူညီခဲ့ကြခြင်း ဖြစ်ပါသည်။

၇။ ဓာတ်အားလိုင်းကန့်သတ်ချက်အရ ချီဖွေငယ်ရေအားလျှပ်စစ်ဓာတ်အားပေးစက်ရုံမှ ထွက်ရှိလာသည့် ဓာတ်အားများကို နိုင်ငံတော်အနေဖြင့် အပြည့်အဝ ရယူမသုံးစွဲနိုင်ခြင်းကြောင့် ချီဖွေငယ်ရေအားလျှပ်စစ်ကုမ္ပဏီ၏ ဝင်ငွေရရှိမှုသည်လည်း စက်ရုံပြင်ဆင်ထိန်းသိမ်းမှုစရိတ်ကိုပင် ကာမိနိုင်စွမ်းမရှိသေးခြင်းအတွက် ဖက်စပ်သဘောတူစာချုပ်တွင် အဆိုပါအချက်ကို ထည့်သွင်းဖော်ပြခဲ့ရခြင်းဖြစ်ပါသည်။

၈။ JV စာချုပ်တွင် သဘောတူထားခဲ့သည့်အတိုင်း COD အချိန်အထိ အသုံးစရိတ်များကို စီမံကိန်းကုန်ကျစရိတ် (Project Cost) တွင် ထည့်သွင်းရမည်ဖြစ်ပါသည်။ ဖက်စပ်သဘောတူစာချုပ်ပါ စီးပွားဖြစ် စက်စတင်လည်ပတ်သည့်ရက် (COD) ၏ အဓိပ္ပါယ်ဖွင့်ဆိုချက်တွင် **"ဓာတ်အားပေးစက်ရုံသည် နေ့စဉ်ပျမ်းမျှ ၇၀ မဂ္ဂါဝပ် (ထွက်ရှိဓာတ်အား၏ ၇၀%) စဉ်ဆက်မပြတ် ထုတ်လုပ်နိုင်ပြီး၊ နှစ်စဉ်ဓာတ်အားရောင်းရငွေသည် အရှုံးအမြတ်ကာမိသည့်အဆင့် (Break - Even Point) အထိ ရောက်ရှိချိန်၌ COD စတင်ရန် ဝန်ကြီးဌာနက တရားဝင်အတည်ပြုရမည်"** ဟု ဖော်ပြထားသဖြင့် အဆိုပါဖော်ပြချက်များနှင့် ကိုက်ညီချိန်မှသာ COD ရက် သတ်မှတ်နိုင်မည်ဖြစ်ပါသည်။

၉။ ချီဖွေငယ်ရေအားလျှပ်စစ်ကုမ္ပဏီလီမိတက် (CNHC) အမည်ဖြင့် ဖက်စပ်ကုမ္ပဏီထူထောင်ပြီး မြန်မာနိုင်ငံရင်းနှီးမြှုပ်နှံမှုကော်မရှင်၏ ခွင့်ပြုမိန့်ဖြင့် စီးပွားဖြစ်လည်ပတ်မောင်းနှင်နိုင်ရေးအတွက် ကုမ္ပဏီမှတ်ပုံတင်လက်မှတ် ထုတ်ပေးနိုင်ပါရန် ရင်းနှီးမြှုပ်နှံမှုနှင့်ကုမ္ပဏီများညွှန်ကြားမှုဦးစီးဌာနသို့ (၃၀-၁၁-၂၀၁၅) ရက်နေ့တွင် ညှိနှိုင်းအကြောင်းကြားခဲ့ရာ (၄-၁၂-၂၀၁၅) ရက်နေ့တွင် ကုမ္ပဏီမှတ်ပုံတင်လက်မှတ်အား ထုတ်ပေးခဲ့ပါသည်။

၁၀။ JV စာချုပ်အရ COD မတိုင်မီကာလ နှစ်စဉ်အသုံးစရိတ်များသည် Project Cost အဖြစ် ထည့်သွင်းရမည်ဖြစ်သည့်အတွက် COD သတ်မှတ်သည့်အချိန်တွင် Project Cost အား နှစ်ဦးနှစ်ဖက် သဘောတူညီမှုဖြင့် သတ်မှတ်သွားမည်ဖြစ်ပါသည်။

1. CPIYN’s Registration Certificate

Original Copy



营业执照

(副　本) 1/2

注册号530000000018574

名　　称　中电投云南国际电力投资有限公司

类　　型　有限责任公司（法人独资）

住　　所　云南省昆明市滇池路1302号

法定代表人　李光华

注册资本　167035万元整

成立日期　2008年12月15日

经营期限　2008年12月15日至2038年12月15日

经营范围　从事东南亚及国内西南地区电力项目和其它能源项目的投资建设与经营管理，组织电力产品销售；从事电力上下游产品开发、生产与经营（以登记机关核定为准）。法律、法规禁止的，不得经营；应经审批的，未获审批前不得经营。（依法须经批准的项目，经相关部门批准后方可开展经营活动）***

登记机关

2013年12月23日

企业信用信息公示系统网址：www.ynaic.gov.cn

中华人民共和国国家工商行政管理总局监制

Translated copy

Business License

(Duplicate) (1/2)

Registration No.: 530000000018574

Name:	CPI Yunnan International Power Investment Co., Ltd.
Type:	Limited Liability Company (sole proprietorship of legal person)
Address:	No.1302, Dianchi Road, Kunming City, Yunnan Province
Legal Representative:	Li Guanghua
Registered Capital:	RMB 1,670,350,000 only
Establishment Date:	December 15, 2008
Business Term:	December 15, 2008 to December 15, 2038
Business Scope:	Investment, construction and operation management of power projects and other energy projects in Southeast Asia and southwest China; organization of sales of power products; development, manufacturing and operation of upstream and downstream power products (as verified by the registration authority) Items forbidden in laws and regulations shall not be operated; items not reviewed and approved as they should be shall not be operated. (Operation of items subject to approval according to laws shall be conducted only after relevant approvals are obtained from relevant departments)***

Registration Authority: Yunnan Provincial Administration for Industry & Commerce (Seal)

December 23, 2013

Website for enterprise credit information publicity system: www.ynaic.gov.cn

Supervised by the State Administration for Industry & Commerce of the People's Republic of China

2. RVS's Registration Certificate

009619

ပြည်ထောင်စုသမ္မတမြန်မာနိုင်ငံတော်အစိုးရ

အမျိုးသားစီမံကိန်းနှင့် စီးပွားရေးဖွံ့ဖြိုးတိုးတက်မှုဝန်ကြီးဌာန

ကုမ္ပဏီမှတ်ပုံတင်လက်မှတ်

အမှတ် ......၄၅၈၆....../ ၂၀၁၂-၂၀၁၃

မြန်မာနိုင်ငံ ကုမ္ပဏီများ အက်ဥပဒေအရ ..မြတ်အောင်မြင် ဝန်ဆောင်မှု ကုမ္ပဏီလီမိတက်.........

......................................အား ပေးရန်တာဝန် ကန့်သတ်ထားသော လီမိတက်

ကုမ္ပဏီအဖြစ် ..၂၀၁၃.. နှစ်၊ ..ဇန်နဝါရီ... လ၊ ..၂၉.. ရက်နေ့တွင် မှတ်ပုံတင်ခွင့်ပြုလိုက်သည်။

ညွှန်ကြားရေးမှူးချုပ် (ကိုယ်စား)

(နန်းရီရီသန်း ၊ ညွှန်ကြားရေးမှူး)

ရင်းနှီးမြှုပ်နှံမှုနှင့်ကုမ္ပဏီများညွှန်ကြားမှုဦးစီးဌာန

THE GOVERNMENT OF THE REPUBLIC OF THE UNION OF MYANMAR
MINISTRY OF NATIONAL PLANNING AND ECONOMIC DEVELOPMENT

CERTIFICATE OF INCORPORATION

NO. ....4586.......... of 2012-2013

I hereby certify that ....ROYAL VICTORY SERVICES COMPANY............
LIMITED...is this day incorporated
under the Myanmar Companies Act and that the company is Limited.

Given under my hand at Nay Pyi Taw this ....TWENTY-NINTH..........day
of ..JANUARY, TWO THOUSAND AND THIRTEENTH.................

For Director General
(Nang Yi Yi Than, Director)
Directorate of Investment and Company Administration

ကုမ္ပဏီနှင့်သက်ဆိုင်သည့်အချက်အလက်များ

(က)	ဆုပ်ကိုင်မှုမိမိကိုယ်တိုင်အမည်	......ဦးအောင်ဝင်း (၁၃/ဟပန(နိုင်)၀၂၂၂၃၈)...
(ခ)	ကုမ္ပဏီ ရုံးခန်းလိပ်စာ	......အမှတ် (၅၀)၊ ဗိုလ်အောင်ကျော်လမ်း၊ အောက်ဘလောက်၊ ဗိုလ်တထောင်မြို့နယ်၊ ရန်ကုန်မြို့။......
(ဂ)	ဆက်သွယ်ရန် ဖုန်းနံပါတ်	......၀၁-၃၉၂၂၅၇၊ ၀၁-၃၉၂၂၅၇...........
(ဃ)	ဒါရိုက်တာများ အမည်စာရင်း	......(၁) ဦးကြည်မြင့်.................. ၁၃/သပန(နိုင်)၀၀၁၀၀၇

မှတ်ချက်။ (၁) ဤကုမ္ပဏီမှတ်ပုံတင်လက်မှတ်သည်မှတ်ပုံတင်ရက်စွဲ(၂၉-၁-၂၀၁၃)မှ (၂၈-၁-၂၀၁၈)ရက်နေ့အထိ (၅)နှစ်သက်တမ်းအတွက်သာ ဖြစ်သည်။ သက်တမ်း မကုန်ဆုံးမီ (၃)လအလိုတွင် သက်တမ်းတိုးရန် ရင်းနှီးမြှုပ်နှံမှုနှင့် ကုမ္ပဏီများ ညွှန်ကြားမှု ဦးစီးဌာနသို့ လျှောက်ထား ရမည်။

(၂) ကုမ္ပဏီ အနေဖြင့် သင်းဖွဲ့မှတ်တမ်းတွင်အဆိုပြု ထားသော လုပ်ငန်းရည်ရွယ်ချက်များကိုသာ လုပ်ကိုင်ရမည်။

(၃) သင်းဖွဲ့မှတ်တမ်းပါ ရည်ရွယ်ချက်များသည် သက်ဆိုင်ရာ ပြည်ထောင်စု ဝန်ကြီးဌာန၏ ဥပဒေများ နည်းဥပဒေများ လုပ်ထုံးလုပ်နည်း များနှင့်အညီ ခွင့်ပြုချက် ရရှိမှသာ ဆောင်ရွက်ခွင့် ရှိမည် ဖြစ်ပါသည်။

(၄) လုပ်ငန်းရည်ရွယ်ချက် ပြောင်းလဲ လုပ်ကိုင်လိုပါက ပြောင်းလဲ လုပ်ကိုင် လိုသည့် လုပ်ငန်း ရည်ရွယ်ချက်များအား သင်းဖွဲ့မှတ်တမ်းတွင် ပြင်ဆင် မှတ်ပုံတင်ရန်အတွက် ဒါရိုက်တာအဖွဲ့ (BOD)၏ အထူး အစည်းအဝေး ဆုံးဖြတ်ချက် မှတ်တမ်းနှင့်အတူ ရင်းနှီးမြှုပ်နှံမှုနှင့်ကုမ္ပဏီများ ညွှန်ကြားမှု ဦးစီးဌာန သို့ လျှောက်ထား ရမည်။

ညွှန်ကြားရေးမှူးချုပ်(ကိုယ်စား)
(မြင့်လွင်၊ ဒုတိယညွှန်ကြားရေးမှူး)

3. Registration Certificate of Chipwi Nge Hydropower Co., Ltd.

ပြည်ထောင်စုသမ္မတမြန်မာနိုင်ငံတော်အစိုးရ

အမျိုးသားစီမံကိန်းနှင့် စီးပွားရေးဖွံ့ဖြိုးတိုးတက်မှုဝန်ကြီးဌာန

ကုမ္ပဏီမှတ်ပုံတင်လက်မှတ်

အမှတ် ၆ ဂျေဗွီ / ၂၀၁၅-၂၀၁၆

မြန်မာနိုင်ငံ ကုမ္ပဏီများ အက်ဥပဒေအရ ချီဖွေငယ် ရေအားလျှပ်စစ် ကုမ္ပဏီ လီမိတက် အား ပေးရန်တာဝန် ကန့်သတ်ထားသော လီမိတက် ကုမ္ပဏီအဖြစ် ၂၀၁၅ ခုနှစ် ဒီဇင်ဘာ လ ၄ ရက်နေ့တွင် မှတ်ပုံတင်ခွင့်ပြုလိုက်သည်။

ညွှန်ကြားရေးမှူးချုပ်(ကိုယ်စား)
(နီလာမူ ညွှန်ကြားရေးမှူး)
ရင်းနှီးမြှုပ်နှံမှုနှင့်ကုမ္ပဏီများညွှန်ကြားမှုဦးစီးဌာန

THE GOVERNMENT OF THE REPUBLIC OF THE UNION OF MYANMAR
MINISTRY OF NATIONAL PLANNING AND ECONOMIC DEVELOPMENT

CERTIFICATE OF INCORPORATION

NO. 6JV of 2015-2016

I hereby certify that CHIPWI NGE HYDROPOWER COMPANY LIMITED is this day incorporated under the Myanmar Companies Act and that the company is Limited.

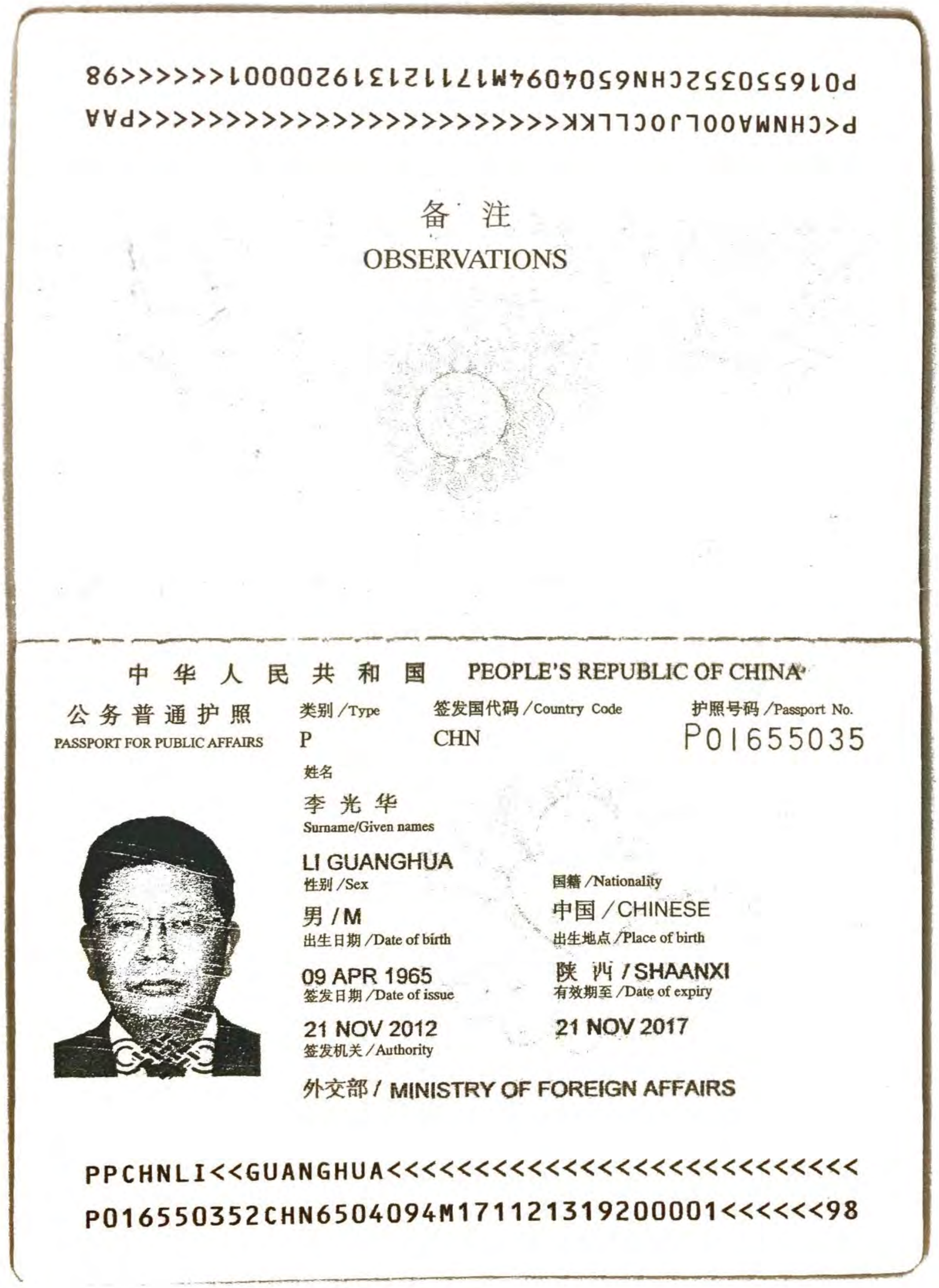
Given under my hand at Nay Pyi Taw this FOURTH day of DECEMBER, TWO THOUSAND AND FIFTEEN.

For Director General
(Nilar Mu - Director)
Directorate of Investment and Company Administration

ဤကုမ္ပဏီမှတ်ပုံတင်လက်မှတ်သည်(၄-၁၂-၂၀၁၅)မှ (၃-၁၂-၂၀၂၀) ရက်နေ့အထိ (၅)နှစ် သက်တမ်းအတွက်သာ ဖြစ်သည်။ သက်တမ်းမကုန်ဆုံးမီ (၃)လအလိုတွင် သက်တမ်းတိုးရန် ရင်းနှီးမြှုပ်နှံမှုနှင့် ကုမ္ပဏီများညွှန်ကြားမှု ဦးစီးဌာနသို့ လျှောက်ထားရမည်။

ညွှန်ကြားရေးမှူးချုပ်(ကိုယ်စား)
(သက်ပိုင် ဒုတိယညွှန်ကြားရေးမှူး)

1. Li Guanghua’s Passport



备 注
OBSERVATIONS

中 华 人 民 共 和 国 PEOPLE’S REPUBLIC OF CHINA

公务普通护照
PASSPORT FOR PUBLIC AFFAIRS

类别 /Type
P

签发国代码 /Country Code
CHN

护照号码 /Passport No.
P01655035

姓名
李光华
Surname/Given names
LI GUANGHUA

性别 /Sex
男 / M

国籍 /Nationality
中国 / CHINESE

出生日期 /Date of birth
09 APR 1965

出生地点 /Place of birth
陕 西 / SHAANXI

签发日期 /Date of issue
21 NOV 2012

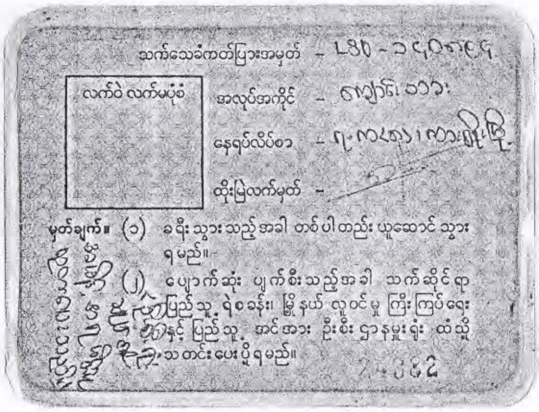
有效期至 /Date of expiry
21 NOV 2017

签发机关 /Authority
外交部 / MINISTRY OF FOREIGN AFFAIRS

PPCHNLI<<GUANGHUA<<<<<<<<<<<<<<<<<<<<<<<<<<<<<
P016550352CHN6504094M171121319200001<<<<<<98

2. U Zaw Win's ID





1. Brief Introduction to CPI

China Power Investment Corporation (CPI) is a large state-owned enterprise which belongs to China State-owned Assets Supervision & Administration Commission. The registered address of CPI is building 3, No.28, Financial Street, Xicheng District, Beijing with a registered capital of RMB 12billion (USD 1.951 billion). The core business of CPI is power investment.

Business operation

By the end of 2013, the installed capacity of CPI has reached 89680MW, with a total asset of RMB 617.4 billion (USD 100.39 billion). In year 2013, the electricity output was 367.8 billion kW·h. The coal output was74, 100,000 tons and the electrolytic aluminum output was2,893,000 tons.

Strength & Advantage

CPI has 207 member companies/institutions and participating companies with 127,000 employees in total.

As one of the five largest power groups in China, CPI possesses the cutting-edge techniques and equipment, reasonably-distributed power resource spots and a healthy market. In particular, CPI has its advantage in hydropower development. Among the five largest power groups, CPI has the maximum installed capacity ratio and the largest installed capacity scale. CPI owns a couple of large-scale hydropower stations with over 1,000MW such as Longyang Gorge, Lijia Gorge, Gongbo Gorge, Wuqiangxi, and Sanbanxi. Meanwhile, CPI is developing and constructing more hydropower stations such as Laxiwa (4,200MW) and Jishi Gorge (1,020MW).

In terms of international cooperation, CPI holds part of shares of Macao Electricity Company (CEM). Also CPI has undertaken the EPC contract of Turkey ISKENDERUN Power Plant and the 2x125MW operation of Baku Coal-fired Power Plant of Bangladesh. Moreover, CPI is actively seeking for power investment projects and service projects in Brazil, Vietnam, Indonesia and other countries.

2. Brief introduction to CPI Yunnan International Power Investment Co., Ltd.

CPI Yunnan International Power Investment Co., Ltd. (hereinafter abbreviated to be CPIYN) is the sub-company solely-funded by China Power Investment Company, which dedicates in investment and management of power and other sources in Southeast Asia and Southwest China, developing power product, development, manufacturing and selling upstream and downstream. The registered capital is RMB1670million (USD 271.5 million) and was founded in 8th, Dec, 2008 and registered place is Kunming,

Yunnan, China. Up to now, registration of the company has been generally completed.

Business operation

By the end of 2013, the installed capacity of CPIYN has reached 1657MW, with a total asset of RMB902million (USD 146.6 million). In year 2013, the electricity output was 3.38 billion kW·h. The cement output was900, 000 tons.

CPIYN began with the development of the Hydropower Projects in the Upstream Ayeyawady River Basin and expanded by setting up CPI Yunnan Branch and Upstream Ayeyawady Confluence Basin Hydropower Co., Ltd.(ACHC), merging and restructuring CPIYN New Energy Co., Ltd., Tengchong Tengyue Cement Co., Ltd., Yunnan Energy (Group) Holding Co., Ltd. and Yunnan Energy Luquan Power & Phosphorus Development Co., Ltd and with 968 employees in total.

Mr. Li Guanghua, DGM of CPI acts as Chairwoman of the Board of CPI Yunnan Company. The company has General Management Admin Dept., Planning & Development Dept., HR Dept., Finance and Asset Management Dept., Safe Production Dept., Engineering Management Dept., Supervision & Auditing Dept., Corporate Culture Dept., Myanmar Liaison Dept., Materials Management Dept. and Beijing Office and other 7 member companies/institutions and participating companies.

2.2 Annual report of CPIYN (2012 and 2013)

2.2.1 Original annual report 0f 2012

合并资产负债表

编制单位：中电投云南国际电力投资有限公司　　2012年12月31日　　金额单位：元

项　　目	行次	期末数	期初数	附注编号
流动资产：	1			
货币资金	2	73,513,545.48	94,244,095.03	八、（一）
△结算备付金	3			
△拆出资金	4			
交易性金融资产	5	669,138.80		八、（二）
应收票据	6	500,000.00		八、（三）
应收账款	7	75,889,114.89		八、（五）
预付款项	8	63,959,144.64	723,305,039.20	八、（七）
△应收保费	9			
△应收分保账款	10			
△应收分保合同准备金	11			
应收利息	12			
应收股利	13	19,418,731.64		八、（四）
其他应收款	14	314,885,161.91	27,835,491.50	八、（六）
△买入返售金融资产	15			
存货	16	17,577,695.24		八、（八）
其中：原材料	17	15,605,408.84		
库存商品（产成品）	18	5,474.43		
一年内到期的非流动资产	19			
其他流动资产	20			
流动资产合计	21	568,400,532.59	845,384,625.73	
非流动资产：	22			
△发放贷款及垫款	23			
可供出售金融资产	24			
持有至到期投资	25			
长期应收款	26			
长期股权投资	27	710,076,912.93		八、（九）
投资性房地产	28	10,525,142.61		八、（十）
固定资产原价	29	9,182,015,550.93	39,049,961.79	八、（十一）
减：累计折旧	30	1,251,081,145.34	12,140,917.76	八、（十一）
固定资产净值	31	7,930,934,423.59	26,909,044.03	八、（十一）
减：固定资产减值准备	32			八、（十一）
固定资产净额	33	7,930,934,423.59	26,909,044.03	八、（十一）
在建工程	34	6,396,556,557.40	4,204,931,129.59	八、（十二）
工程物资	35	172,267,178.84	190,165,949.07	八、（十三）
固定资产清理	36			
生产性生物资产	37	-		
油气资产	38			
无形资产	39	763,397,475.12	147,362,668.96	八、（十四）
开发支出	40			
商誉	41	239,402,256.50		八、（十五）
长期待摊费用	42	41,365,380.07		八、（十六）
递延所得税资产	43	5,492,910.96		八、（十七）
其他非流动资产	44			
其中：特准储备物资	45			
非流动资产合计	46	16,259,408,618.01	4,569,368,193.03	
	47			
	48			
	49			
	50			
	51			
	52			
	53			
	54			
	55			
	56			
	57			
	58			
	59			
	60			
	61			
	62			
	63			
资　产　总　计	64	16,827,809,150.60	5,414,652,815.78	

法定代表人：　　主管会计工作负责人：　　会计机构负责人：

3

合并资产负债表（续）

编制单位：中电投云南国际电力投资有限公司　　2012年12月31日　　金额单位：元

项目	行次	期末数	期初数	附注编号
流动负债：	65			
短期借款	66	1,904,000,000.00	500,000,000.00	八、（十八）
△向中央银行借款	67			
△吸收存款及同业存放	68			
△拆入资金	69			
交易性金融负债	70			
应付票据	71	244,363,684.46		八、（十九）
应付账款	72	737,089,330.99	283,029,096.72	八、（二十）
预收款项	73	5,148,099.69		八、（二十一）
△卖出回购金融资产款	74			
△应付手续费及佣金	75			
应付职工薪酬	76	6,094,017.28	3,015,919.78	八、（二十二）
其中：应付工资	77	699,382.45		
应付福利费	78	22,253.85		
#其中：职工奖励及福利基金	79			
应交税费	80	17,243,368.89	-8,987,135.34	八、（二十三）
其中：应交税金	81	-21,214,064.26	-9,031,793.34	
应付利息	82	129,580,027.31	22,205,084.25	八、（二十五）
应付股利	83	19,665,800.00		八、（二十四）
其他应付款	84	553,129,838.59	4,403,948.93	八、（二十六）
△应付分保账款	85			
△保险合同准备金	86			
△代理买卖证券款	87			
△代理承销证券款	88			
一年内到期的非流动负债	89	564,608,330.52		八、（二十七）
其他流动负债	90			
流动负债合计	91	4,180,952,517.74	803,666,913.35	
非流动负债：	92			
长期借款	93	8,890,486,500.00	3,306,000,000.00	八、（二十八）
应付债券	94			
长期应付款	95	746,777,321.86		八、（二十九）
专项应付款	96	300,000.00		八、（三十）
预计负债	97			
递延所得税负债	98	97,739,949.15		八、（十七）
其他非流动负债	99			
其中：特准储备基金	100			
非流动负债合计	101	9,735,303,771.01	3,306,000,000.00	
负 债 合 计	102	13,916,256,288.75	4,109,666,913.35	
所有者权益（或股东权益）：	103			
实收资本（股本）	104	1,670,350,000.00	1,205,350,000.00	八、（三十一）
国家资本	105	1,670,350,000.00	1,205,350,000.00	
其中：国有法人资本	106	1,670,350,000.00	1,205,350,000.00	
集体资本	107			
民营资本	108			
其中：个人资本	109			
外商资本	110			
#减：已归还投资	111			
实收资本（或股本）净额	112	1,670,350,000.00	1,205,350,000.00	
资本公积	113			
减：库存股	114			
专项储备	115			
盈余公积	116			
其中：法定公积金	117			
任意公积金	118			
#储备基金	119			
#企业发展基金	120			
#利润归还投资	121			
△一般风险准备	122			
未分配利润	123	-144,096,672.92		八、（三十二）
外币报表折算差额	124	-375,693.15	-364,097.57	
归属于母公司所有者权益合计	125	1,525,877,633.93	1,204,985,902.43	
*少数股东权益	126	1,385,675,227.92		
所有者权益合计	127	2,911,552,861.85	1,204,985,902.43	
负债和所有者权益总计	128	16,827,809,150.60	5,314,652,815.78	

法定代表人：　　主管会计工作负责人：　　会计机构负责人：

合并利润表

编制单位：中电投云南国际电力投资有限公司　　2012年度　　金额单位：元

项　　目	行次	本期金额	上期金额	附注编号
一、营业总收入	1	778,233,563.73	-	
其中：营业收入	2	778,233,563.73		
其中：主营业务收入	3	708,998,523.73		八、（三十三）
其他业务收入	4	69,235,040.00		八、（三十三）
△利息收入	5			
△已赚保费	6			
△手续费及佣金收入	7			
二、营业总成本	8	944,469,343.09	-	
其中：营业成本	9	507,586,252.65		
其中：主营业务成本	10	491,212,079.36		八、（三十三）
其他业务成本	11	16,374,173.29		八、（三十三）
△利息支出	12			
△手续费及佣金支出	13			
△退保金	14			
△赔付支出净额	15			
△提取保险合同准备金净额	16			
△保单红利支出	17			
△分保费用	18			
营业税金及附加	19	7,788,815.91		
销售费用	20			
管理费用	21	11,066,358.06		
其中：研究与开发费	22			
财务费用	23	423,020,938.35		
其中：利息支出	24	411,713,539.30		
利息收入	25	1,734,196.71		
汇兑净损失（净收益以"-"号填列）	26	-591,690.93		
资产减值损失	27	-4,992,081.88		八、（三十四）
其他	28			
加：公允价值变动收益（损失以"-"号填列）	29	-61,389.20		八、（三十五）
投资收益（损失以"-"号填列）	30	22,647,616.67		八、（三十六）
其中：对联营企业和合营企业的投资收益	31			
△汇兑收益（损失以"-"号填列）	32			
三、营业利润（亏损以"-"号填列）	33	-143,649,551.89	-	
加：营业外收入	34	3,775,825.90		八、（三十七）
其中：非流动资产处置利得	35	14,025.23		
非货币性资产交换利得	36			
政府补助	37	1,963,539.04		
债务重组利得	38			
减：营业外支出	39	4,099,650.50		八、（三十八）
其中：非流动资产处置损失	40	761,126.12		
非货币性资产交换损失	41			
债务重组损失	42			
四、利润总额（亏损总额以"-"号填列）	43	-143,973,376.49	-	
减：所得税费用	44	7,318,398.71		八、（三十九）
五、净利润（净亏损以"-"号填列）	45	-151,291,775.20	-	
归属于母公司所有者的净利润	46	-140,909,070.89		
*少数股东损益	47	-10,382,704.31		
六、每股收益：	48			
基本每股收益	49			
稀释每股收益	50			
七、其他综合收益	51	-2,083,286.24		
八、综合收益总额	52	-153,375,061.44	-	
归属于母公司所有者的综合收益总额	53	-140,909,070.89		
*归属于少数股东的综合收益总额	54	-12,465,990.55		

法定代表人：　　主管会计工作负责人：　　会计机构负责人：

合并现金流量表

2012年度

编制单位：中电投云南国际电力投资有限公司　　　　金额单位：元

项　　目	行次	本期金额	上期金额	附注编号
一、经营活动产生的现金流量：	1			
销售商品、提供劳务收到的现金	2	9[illegible],497,362.64		
△客户存款和同业存放款项净增加额	3			
△向中央银行借款净增加额	4			
△向其他金融机构拆入资金净增加额	5			
△收到原保险合同保费取得的现金	6			
△收到再保险业务现金净额	7			
△保户储金及投资款净增加额	8			
△处置交易性金融资产净增加额	9			
△收取利息、手续费及佣金的现金	10			
△拆入资金净增加额	11			
△回购业务资金净增加额	12			
收到的税费返还	13			
收到其他与经营活动有关的现金	14	3,757,800.67		
经营活动现金流入小计	15	924,248,863.21		
购买商品、接受劳务支付的现金	16	260,128,828.10		
△客户贷款及垫款净增加额	17			
△存放中央银行和同业款项净增加额	18			
△支付原保险合同赔付款项的现金	19			
△支付利息、手续费及佣金的现金	20			
△支付保单红利的现金	21			
支付给职工以及为职工支付的现金	22	86,687,317.98		
支付的各项税费	23	65,452,257.25		
支付其他与经营活动有关的现金	24	118,964,941.55		
经营活动现金流出小计	25	530,129,243.86		
经营活动产生的现金流量净额	26	394,120,719.35		
二、投资活动产生的现金流量：	27			
收回投资收到的现金	28	56,058,207.97		
取得投资收益收到的现金	29	8,078,000.00		
处置固定资产、无形资产和其他长期资产所收回的现金净额	30	10,169,193.01		
处置子公司及其他营业单位收到的现金净额	31			
收到其他与投资活动有关的现金	32		10,893,845.40	
投资活动现金流入小计	33	74,305,300.98	10,893,845.40	
购建固定资产、无形资产和其他长期资产所支付的现金	34	838,695,442.41	2,544,028,323.12	
投资支付的现金	35			
△质押贷款净增加额	36			
取得子公司及其他营业单位支付的现金净额	37	951,973,160.98		
支付其他与投资活动有关的现金	38			
投资活动现金流出小计	39	1,790,668,603.39	2,544,028,323.12	
投资活动产生的现金流量净额	40	-1,716,364,212.41	-2,533,134,477.72	
三、筹资活动产生的现金流量：	41			
吸收投资收到的现金	42	485,000,000.00	370,000,000.00	
其中：子公司吸收少数股东投资收到的现金	43			
取得借款所收到的现金	44	5,498,860,604.84	5,882,197,278.00	
△发行债券收到的现金	45			
收到其他与筹资活动有关的现金	46			
筹资活动现金流入小计	47	5,983,860,604.84	6,252,197,278.00	
偿还债务所支付的现金	48	4,301,786,870.55	3,506,363,288.00	
分配股利、利润或偿付利息所支付的现金	49	358,598,988.78	129,351,809.11	
其中：子公司支付给少数股东的股利、利润	50	31,556,000.00		
支付其他与筹资活动有关的现金	51		1,500,000.00	
筹资活动现金流出小计	52	4,660,383,859.33	3,639,215,097.11	
筹资活动产生的现金流量净额	53	1,323,504,945.51	2,612,982,180.89	
四、汇率变动对现金及现金等价物的影响	54		-242,332.52	
五、现金及现金等价物净增加额	55	-18,720,547.55	79,605,490.65	
加：期初现金及现金等价物余额	56	94,244,093.03	14,638,602.38	
六、期末现金及现金等价物余额	57	75,523,545.48	94,244,093.03	

法定代表人：　　　　主管会计工作负责人：　　　　会计机构负责人：

6

2.2.2 Translation annual report of 2012

BLANCE SHEET	31December 2012 Unit: RMB	
ITEM	YEAR END	YEAR BEGINNING
Current Assets	568,400,532.59	845,284,623.73
Cash	75,513,545.48	94,244,093.03
Financial assets held-for-trade	659,138.80	
Notes receivable	500,000.00	
Accounts receivable	75,889,114.88	
Prepaid expenses	63,959,144.64	723,205,039.20
Dividends receivable	19,416,731.64	
Other receivables	314,885,161.91	27,835,491.50
Inventory	17,577,695.24	
Non-current Assets	16,259,408,618.01	4,569,368,192.05
Long-term stock Investments	710,076,912.93	
Investment real estate	10,525,142.61	
Fixed assets-net values	7,930,934,423.59	26,909,044.03
Construction in progress	6,395,556,557.40	4,204,931,129.99
Construction materials	172,267,178.84	190,165,949.07
Intangible assets	753,397,475.12	147,362,068.96
Goodwill	239,402,236.50	
Long term prepaid expenses	41,755,780.07	
Deferred income tax assets	5,492,910.95	
Total Assets	16,827,809,150.60	5,414,652,815.78

Current Liability	4,180,932,517.74	903,666,913.35
Short-term bank loan	1,904,000,000.00	600,000,000.00
Notes payable	244,363,684.46	
Accounts payable	737,089,330.99	283,029,096.72
Advances from customers	5,148,099.69	
Wages payable	6,094,017.29	3,015,919.78
Taxes payable	17,243,388.89	-8,987,136.34
Interest payable	129,590,027.31	22,205,084.26
Dividends payable	19,665,800.00	
Othere payable	553,129,838.59	4,403,948.93
Current portion of long-term liabilities	564,608,330.52	
Non-current Liabilities	9,735,303,771.01	3,306,000,000.00
Long-term bank loan	8,892,487,500.00	3,306,000,000.00
Long-term payable	744,777,321.86	
Restricted payable	300,000.00	
Deferred income tax liabilities	97,738,949.15	
Total Liabilities	13,916,236,288.75	4,209,666,913.35
Owner's Equity	2,911,572,861.85	1,204,985,902.43
Paid in capital (or share) net	1,670,350,000.00	1,205,350,000.00
Undistributed profit	-144,096,672.92	
The difference between the translation of foreign currency statements	-375,693.15	-364,097.57
Minority shareholder's equity	1,385,695,227.92	
Total Liabilities and Owner's Equity	16,827,809,150.60	5,414,652,815.78

PROFIT SHEET	31December 2012 Unit:RMB	
ITEM	YEAR END	YEAR BEGINNING
Revenue	778,233,563.73	-
Minus: operating cost	507,586,252.65	
Operating taxes	7,788,815.91	
Administrative expenses	11,065,358.06	
Financing expenses	423,020,998.35	
Loss of assets impairment	-4,992,081.88	
Add: Changes of fair value assets	-61,389.20	
Income from investment	22,647,616.67	
Operating profit	-143,649,551.89	-
Add: Non-business income	3,775,825.90	
Minus: Non-business expenses	4,099,650.50	
Total profit	-143,973,376.49	-
Minus: Income tax expense	7,318,398.71	
Net profit	-151,291,775.20	-
Other comprehensive income	-2,283,386.24	-
Total comprehensive income	-153,575,161.44	-
Comprehensive income attributable to owner of parent company	-140,909,070.89	
Comprehensive income attributable to minority shareholder	-12,666,090.55	

CASH FLOW SHEET	31December 2012 Unit:RMB	
ITEM	YEAR END	YEAR BEGINNING
Cash Flow From Operation Activities	394,120,719.35	-
Sale Products & Provide Service	920,492,162.64	
Receive Cash From Other Operation Activities	3,757,800.67	
Cash flow-in Amount	924,249,963.31	-
Purchasing Products & Pay for Service	260,124,828.10	
Pay for Employee	85,587,217.06	
Tax	65,452,257.25	
Pay Other Operation Activities Cash	118,964,941.55	
Cash flow-out Amount	530,129,243.96	-
Cash Flow from Investment Activities	-1,716,356,212.41	-2,533,134,477.72
Increase in Investment	56,050,197.97	
Increase in Capital Gain	8,070,000.00	
Cash Flow From Assets Dispose	10,189,193.01	
Increase in Other Investment Activities		10,893,645.40
Cash flow-in Amount	74,309,390.98	10,893,645.40
Cash in Assets、Long Term Investment	838,692,442.41	2,544,028,123.12
Increase in Subsidiary Cash	951,973,160.98	
Cash flow-out Amount	1,790,665,603.39	2,544,028,123.12

Cash Flow from Financial Activities	1,303,504,945.51	2,612,982,180.89
Increase in Investment	465,000,000.00	370,000,000.00
Loan	5,498,888,804.84	5,882,197,278.00
Cash flow-in Amount	5,963,888,804.84	6,252,197,278.00
Pay Loan	4,301,784,870.55	3,508,363,288.00
Pay Dividend、Profits、Interest	358,598,988.78	129,351,809.11
Increase in Other Financial Activities		1,500,000.00
Cash flow-out Amount	4,660,383,859.33	3,639,215,097.11
Foreign Exchange In Cash and equivalent		-242,302.52
Net increase in cash and cash equivalents	-18,730,547.55	79,605,400.65
Add：Beginning balance of cash and cash equivalents	94,244,093.03	14,638,692.38
Final balance of cash and cash equivalents	75,513,545.48	94,244,093.03

2.2.3 Original annual report of 2013

合并资产负债表

编制单位：中电投云南国际电力投资有限公司2013年12月31日　　　　金额单位：元

项　　目	行次	期末数	期初数	附注编号
流动资产：	1			
货币资金	2	115,071,898.75	73,513,365.18	八、（一）
△结算备付金	3			
△拆出资金	4			
交易性金融资产	5	116,543.82	669,138.80	八、（二）
应收票据	6	2,500,000.00	500,000.00	八、（三）
应收账款	7	135,183,235.21	73,889,114.88	八、（四）
预付款项	8	78,707,304.89	63,969,144.64	八、（五）
△应收保费	9			
△应收分保账款	10			
△应收分保合同准备金	11			
应收利息	12	395,606.67		八、（六）
应收股利	13	19,416,731.64	19,416,731.64	八、（七）
其他应收款	14	107,021,913.16	314,885,161.91	八、（八）
△买入返售金融资产	15			
存货	16	10,902,278.05	17,577,895.24	八、（九）
其中：原材料	17	6,790,825.05	15,600,400.84	
库存商品（产成品）	18	3,641.02	5,474.45	
一年内到期的非流动资产	19			
其他流动资产	20	300,000,000.00		八、（十）
流动资产合计	21	689,276,572.18	568,400,532.59	
非流动资产：	22			
△发放贷款及垫款	23			
可供出售金融资产	24			
持有至到期投资	25			
长期应收款	26			
长期股权投资	27	621,679,610.65	710,070,912.95	八、（十二）
投资性房地产	28		16,525,142.61	八、（十三）
固定资产原价	29	9,099,802,047.05	9,182,815,568.93	八、（十四）
减：累计折旧	30	1,491,242,573.47	1,251,881,145.54	
固定资产净值	31	7,608,559,473.58	7,930,934,423.39	
减：固定资产减值准备	32	1,633,208.29		
固定资产净额	33	7,606,926,265.29	7,930,934,423.39	八、（十四）
在建工程	34	7,368,765,301.02	6,305,126,557.40	八、（十五）
工程物资	35	128,964,300.74	172,267,178.84	八、（十六）
固定资产清理	36			
生产性生物资产	37			
油气资产	38			
无形资产	39	774,917,912.49	753,387,475.12	八、（十七）
开发支出	40			
商誉	41	239,402,230.50	239,402,236.58	八、（十八）
长期待摊费用	42	9,069,283.14	61,755,780.07	八、（十九）
递延所得税资产	43	5,021,320.21	5,102,810.95	八、（二十）
其他非流动资产	44			
其中：特准储备物资	45			
非流动资产合计	46	16,788,854,230.04	16,259,408,618.01	
	47			
	48			
	49			
	50			
	51			
	52			
	53			
	54			
	55			
	56			
	57			
	58			
	59			
	60			
	61			
	62			
	63			
资　产　总　计	64	17,478,130,802.22	16,827,809,150.60	

法定代表人：　　　　主管会计工作负责人：　　　　会计机构负责人：

合并资产负债表（续）

编制单位：中电投云南国际电力投资有限公司　　2013年12月31日　　金额单位：元

项　　目	行次	期末数	期初数	附注编号
流动负债：	65			
短期借款	66	1,891,650,000.00	1,904,000,000.00	八、（二十二）
△向中央银行借款	67			
△吸收存款及同业存放	68			
△拆入资金	69			
交易性金融负债	70			
应付票据	71	90,287,837.90	254,362,686.16	八、（二十三）
应付账款	72	892,771,084.24	757,089,330.98	八、（二十四）
预收款项	73	8,309,270.87	3,148,089.88	八、（二十五）
△卖出回购金融资产款	74			
△应付手续费及佣金	75			
应付职工薪酬	76	6,264,617.56	6,866,917.28	八、（二十六）
其中：应付工资	77			
应付福利费	78			
#其中：职工奖励及福利基金	79			
应交税费	80	33,906,203.19	17,245,398.89	八、（二十七）
其中：应交税金	81			
应付利息	82	264,091,542.45	129,590,827.37	八、（二十八）
应付股利	83	19,665,400.00	10,665,860.00	八、（二十九）
其他应付款	84	119,228,350.56	553,229,838.59	八、（三十）
△应付分保账款	85			
△保险合同准备金	86			
△代理买卖证券款	87			
△代理承销证券款	88			
一年内到期的非流动负债	89	967,906,226.14	454,608,370.62	八、（三十一）
其他流动负债	90			
流动负债合计	91	4,459,602,856.74	4,180,932,517.74	
非流动负债：	92			
长期借款	93	10,381,543,333.33	8,892,487,306.10	八、（三十二）
应付债券	94			
长期应付款	95	148,606,331.33	734,777,321.86	八、（三十三）
专项应付款	96		300,000.00	八、（三十四）
预计负债	97			
递延所得税负债	98	108,890,348.84	97,728,090.15	八、（二十）
其他非流动负债	99	3,000,000.00		八、（三十五）
其中：特准储备基金	100			
非流动负债合计	101	10,642,040,013.50	9,735,302,771.01	
负 债 合 计	102	15,101,642,870.24	13,916,235,288.75	
所有者权益（或股东权益）：	103			
实收资本（股本）	104	1,624,820,000.00	1,670,370,000.00	八、（三十六）
国有资本	105	1,624,820,000.00	1,670,370,000.00	八、（三十六）
其中：国有法人资本	106	1,624,820,000.00	1,670,370,000.00	八、（三十六）
集体资本	107			
民营资本	108			
其中：个人资本	109			
外商资本	110			
#减：已归还投资	111			
实收资本（或股本）净额	112	1,624,820,000.00	1,670,370,000.00	八、（三十六）
资本公积	113	125,882,818.67		八、（三十七）
减：库存股	114			
专项储备	115			
盈余公积	116			
其中：法定公积金	117			
任意公积金	118			
#储备基金	119			
#企业发展基金	120			
#利润归还投资	121			
△一般风险准备	122			
未分配利润	123	-317,034,424.10	-144,095,672.92	八、（三十八）
外币报表折算差额	124	-317,701.41	-374,803.15	
归属于母公司所有者权益合计	125	1,335,462,972.50	1,525,877,633.93	
*少数股东权益	126	1,033,024,959.48	1,385,695,227.92	
所有者权益合计	127	2,368,487,931.98	2,911,572,861.85	
负债和所有者权益总计	128	17,470,130,802.22	16,827,808,150.60	

法定代表人：　　　　主管会计工作负责人：　　　　会计机构负责人：

合并利润表

编制单位：中电投云南国际电力投资有限公司　　　　2013年度　　　　金额单位：元

项　　　目	行次	本期金额	上期金额	附注编号
一、营业总收入	1	782,855,845.86	778,235,363.73	
其中：营业收入	2	782,855,845.86	778,235,363.73	八、（三十九）
其中：主营业务收入	3	768,610,042.25	708,999,323.73	八、（三十九）
其他业务收入	4	14,245,803.61	69,236,040.00	八、（三十九）
△利息收入	5			
△已赚保费	6			
△手续费及佣金收入	7			
二、营业总成本	8	1,182,764,469.28	984,409,243.09	
其中：营业成本	9	651,474,516.83	507,586,252.65	八、（三十九）
其中：主营业务成本	10	642,070,419.03	491,212,079.36	八、（三十九）
其他业务成本	11	9,403,096.72	16,374,173.29	八、（三十九）
△利息支出	12			
△手续费及佣金支出	13			
△退保金	14			
△赔付支出净额	15			
△提取保险合同准备金净额	16			
△保单红利支出	17			
△分保费用	18			
营业税金及附加	19	8,528,587.56	7,706,816.91	
销售费用	20			
管理费用	21	6,146,391.77	11,665,158.06	
其中：研究与开发费	22			
财务费用	23	520,557,320.47	423,020,908.35	
其中：利息支出	24	518,906,084.90	411,713,239.30	
利息收入	25	6,591,186.32	-1,734,196.71	
汇兑净损失（净收益以"-"号填列）	26			
资产减值损失	27	-3,863,555.93	-4,992,081.88	八、（四十）
其他	28			
加：公允价值变动收益（损失以"-"号填列）	29	76,268.82	-61,390.20	八、（四十一）
投资收益（损失以"-"号填列）	30	31,146,168.02	22,647,616.67	八、（四十二）
其中：对联营企业和合营企业的投资收益	31			
△汇兑收益（损失以"-"号填列）	32			
三、营业利润（亏损以"-"号填列）	33	-368,685,228.40	-143,649,331.89	
加：营业外收入	34	13,790,120.56	3,775,825.90	八、（四十三）
其中：非流动资产处置利得	35	11,272,189.25		
非货币性资产交换利得	36			
政府补助	37	660,985.49		
债务重组利得	38			
减：营业外支出	39	4,105,073.83	4,099,650.50	八、（四十四）
其中：非流动资产处置损失	40	2,757,959.78	751,125.12	
非货币性资产交换损失	41			
债务重组损失	42			
四、利润总额（亏损总额以"－"号填列）	43	-359,000,181.67	-143,973,376.49	
减：所得税费用	44	2,469,947.13	7,318,398.71	八、（四十五）
五、净利润（净亏损以"－"号填列）	45	-361,470,128.80	-151,291,775.20	
归属于母公司所有者的净利润	46	-271,834,751.24	-140,909,070.89	
*少数股东损益	47	-89,635,377.56	-10,382,704.31	
六、每股收益：	48			
基本每股收益	49			
稀释每股收益	50			
七、其他综合收益	51	-142,008.26	-2,294,981.82	八、（四十六）
八、综合收益总额	52	-361,612,137.06	-153,586,757.02	
归属于母公司所有者的综合收益总额	53	-271,834,751.24	-140,909,070.89	
*归属于少数股东的综合收益总额	54	-89,635,377.56	-10,382,704.31	

法定代表人：　　　　主管会计工作负责人：　　　　会计机构负责人：

合并现金流量表

编制单位：中电投云南国际电力投资有限公司　　　　2013年度　　　　金额单位：元

项　　目	行次	本期金额	上期金额	附注编号
一、经营活动产生的现金流量：	1			
销售商品、提供劳务收到的现金	2	812,665,232.21	920,492,102.10	
△客户存款和同业存放款项净增加额	3			
△向中央银行借款净增加额	4			
△向其他金融机构拆入资金净增加额	5			
△收到原保险合同保费取得的现金	6			
△收到再保险业务现金净额	7			
△保户储金及投资款净增加额	8			
△处置交易性金融资产净增加额	9			
△收取利息、手续费及佣金的现金	10			
△拆入资金净增加额	11			
△回购业务资金净增加额	12			
收到的税费返还	13	948,263.24		
收到其他与经营活动有关的现金	14	313,277,559.49	3,767,880.67	
经营活动现金流入小计	15	1,126,891,055.96	924,260,983.30	
购买商品、接受劳务支付的现金	16	822,980,254.08	290,124,829.10	
△客户贷款及垫款净增加额	17			
△存放中央银行和同业款项净增加额	18			
△支付原保险合同赔付款项的现金	19			
△支付利息、手续费及佣金的现金	20			
△支付保单红利的现金	21			
支付给职工以及为职工支付的现金	22	93,136,492.22	45,583,217.66	
支付的各项税费	23	156,737,376.78	65,452,237.20	
支付其他与经营活动有关的现金	24	341,652,339.73	118,964,941.56	
经营活动现金流出小计	25	1,114,505,762.81	520,125,215.96	
经营活动产生的现金流量净额	26	-27,616,707.75	404,130,740.35	九、(一)
二、投资活动产生的现金流量：	27			
收回投资收到的现金	28	122,244,731.65	56,630,197.97	
取得投资收益收到的现金	29	42,800.95	6,070,009.00	
处置固定资产、无形资产和其他长期资产所收回的现金净额	30	18,307,680.53	10,189,193.61	
处置子公司及其他营业单位收回的现金净额	31	13,520,368.00		
收到其他与投资活动有关的现金	32	7,700,000.00		
投资活动现金流入小计	33	159,302,601.73	74,309,390.58	
购建固定资产、无形资产和其他长期资产所支付的现金	34	946,172,698.62	898,682,542.41	
投资支付的现金	35			
△质押贷款净增加额	36			
取得子公司及其他营业单位支付的现金净额	37		951,973,160.98	
支付其他与投资活动有关的现金	38	202,501,191.00		
投资活动现金流出小计	39	1,148,683,859.62	1,790,695,603.39	
投资活动产生的现金流量净额	40	-989,381,257.90	-1,716,386,212.81	
三、筹资活动产生的现金流量：	41			
吸收投资收到的现金	42		455,000,000.00	
其中：子公司吸收少数股东投资收到的现金	43			
取得借款所收到的现金	44	3,510,711,331.30	5,448,888,404.84	
△发行债券收到的现金	45			
收到其他与筹资活动有关的现金	46	216,666,666.67		
筹资活动现金流入小计	47	3,727,400,000.00	5,903,888,404.84	
偿还债务所支付的现金	48	4,099,449,222.30	4,301,784,870.10	
分配股利、利润或偿付利息所支付的现金	49	550,574,240.26	358,598,988.78	
其中：子公司支付给少数股东的股利、利润	50			
支付其他与筹资活动有关的现金	51	—		
筹资活动现金流出小计	52	4,651,023,462.56	4,660,383,858.33	
筹资活动产生的现金流量净额	53	1,076,376,537.44	1,303,504,546.51	
四、汇率变动对现金及现金等价物的影响	54	-19,140.00		
五、现金及现金等价物净增加额	55	59,328,631.65	-18,730,547.50	
加：期初现金及现金等价物余额	56	75,513,545.88	94,244,093.08	
六、期末现金及现金等价物余额	57	134,843,177.53	75,513,545.88	

法定代表人：　　　　主管会计工作负责人：　　　　会计机构负责人：

2.2.4 Translation annual report 0f 2013

BLANCE SHEET	31December 2013 Unit: RMB	
ITEM	YEAR END	YEAR BEGINNING
Current Assets	689,276,572.18	568,400,532.59
Cash	135,001,896.75	75,513,545.48
Financial assets held-for-trade	116,545.82	659,138.80
Notes receivable	2,500,000.00	500,000.00
Accounts receivable	135,183,235.21	75,889,114.88
Prepaid expenses	78,767,304.89	63,959,144.64
Interest receivable	366,666.67	
Dividends receivable	19,416,731.64	19,416,731.64
Other receivables	107,021,913.15	314,885,161.91
Inventory	10,902,278.05	17,577,695.24
Other current assets	200,000,000.00	
Non-current Assets	16,788,854,230.04	16,259,408,618.01
Long-term stock Investments	621,679,610.65	710,076,912.93
Investment real estate		10,525,142.61
Fixed assets-net values	7,644,926,265.29	7,930,934,423.59
Construction in progress	7,368,765,301.02	6,395,556,557.40
Construction materials	128,964,300.74	172,267,178.84
Intangible assets	774,017,912.49	753,397,475.12
Goodwill	239,402,236.50	239,402,236.50
Long term prepaid expenses	6,069,283.14	41,755,780.07
Deferred income tax assets	5,029,320.21	5,492,910.95
Total Assets	17,478,130,802.22	16,827,809,150.60

Current Liability	4,469,602,856.74	4,180,932,517.74
Short-term bank loan	1,801,400,000.00	1,904,000,000.00
Notes payable	56,287,857.90	244,363,684.46
Accounts payable	892,553,088.14	737,089,330.99
Advances from customers	8,389,270.87	5,148,099.69
Wages payable	6,264,517.58	6,094,017.29
Taxes payable	33,906,203.10	17,243,388.89
Interest payable	264,001,542.45	129,590,027.31
Dividends payable	19,665,800.00	19,665,800.00
Othere payable	419,228,350.56	553,129,838.59
Current portion of long-term liabilities	967,906,226.14	564,608,330.52
Non-current Liabilities	10,640,040,013.50	9,735,303,771.01
Long-term bank loan	10,381,583,333.33	8,892,487,500.00
Long-term payable	146,600,331.33	744,777,321.86
Restricted payable		300,000.00
Deferred income tax liabilities	108,856,348.84	97,738,949.15
Other non-current Liabilities	3,000,000.00	
Total Liabilities	15,109,642,870.24	13,916,236,288.75
Owner's Equity	2,368,487,931.98	2,911,572,861.85
Paid in capital (or share) net	1,624,850,000.00	1,670,350,000.00
Capital reserve	127,062,098.07	
Undistributed profit	-415,931,424.16	-144,096,672.92
The difference between the translation of foreign currency statements	-517,701.41	-375,693.15
Minority shareholder's equity	1,033,024,959.48	1,385,695,227.92
Total Liabilities and Owner's Equity	17,478,130,802.22	16,827,809,150.60

PROFIT SHEET	31December 2013 Unit:RMB	
ITEM	YEAR END	YEAR BEGINNING
Revenue	782,855,845.84	778,233,563.73
Minus: operating cost	651,474,516.33	507,586,252.65
Operating taxes	8,529,587.96	7,788,815.91
Administrative expenses	6,186,391.77	11,065,358.06
Financing expenses	520,537,520.15	423,020,998.35
Loss of assets impairment	-3,963,555.93	-4,992,081.88
Add: Changes of fair value assets	76,938.02	-61,389.20
Income from investment	31,146,448.02	22,647,616.67
Operating profit	-368,685,228.40	-143,649,551.89
Add: Non-business income	13,790,120.56	3,775,825.90
Minus: Non-business expenses	4,105,073.83	4,099,650.50
Total profit	-359,000,181.67	-143,973,376.49
Minus: Income tax expense	2,469,947.13	7,318,398.71
Net profit	-361,470,128.80	-151,291,775.20
Other comprehensive income	-142,008.26	-2,294,981.82
Total comprehensive income	-361,612,137.06	-153,586,757.02
Comprehensive income attributable to owner of parent company	-271,834,751.24	-140,909,070.89
Comprehensive income attributable to minority shareholder	-89,635,377.56	-10,382,704.31

CASH FLOW SHEET	31December 2013 Unit:RMB	
ITEM	YEAR END	YEAR BEGINNING
Cash Flow From Operation Activities	-27,636,707.75	394,120,719.35
Sale Products & Provide Service	812,653,232.21	920,492,162.64
Tax Return	938,263.26	
Receive Cash From Other Operation Activities	313,277,559.59	3,757,800.67
Cash flow-in Amount	1,126,869,055.06	924,249,963.31
Purchasing Products & Pay for Service	522,980,264.08	260,124,828.10
Pay for Employee	93,130,482.22	85,587,217.06
Tax	156,737,676.78	65,452,257.25
Pay Other Operation Activities Cash	381,657,339.73	118,964,941.55
Cash flow-out Amount	1,154,505,762.81	530,129,243.96
Cash Flow from Investment Activities	-989,381,257.96	-1,716,356,212.41
Increase in Investment	122,241,731.65	56,050,197.97
Increase in Capital Gain	42,800.95	8,070,000.00
Cash Flow From Assets Dispose	15,307,680.33	10,189,193.01
Increase in dispose subsidiary	13,920,388.80	
Increase in Other Investment Activities	7,790,000.00	
Cash flow-in Amount	159,302,601.73	74,309,390.98
Cash in Assets、Long Term Investment	946,152,668.69	838,692,442.41

Increase in Subsidiary Cash		951,973,160.98
Increase in Other Investment Activities	202,531,191.00	
Cash flow-out Amount	1,148,683,859.69	1,790,665,603.39
Cash Flow from Financial Activities	1,076,376,537.44	1,303,504,945.51
Increase in Investment		465,000,000.00
Loan	5,510,733,333.33	5,498,888,804.84
Cash From Financial Activities	216,666,666.67	
Cash flow-in Amount	5,727,400,000.00	5,963,888,804.84
Pay Loan	4,090,449,222.30	4,301,784,870.55
Pay Dividend、Profits、Interest	560,574,240.26	358,598,988.78
Cash flow-out Amount	4,651,023,462.56	4,660,383,859.33
Foreign Exchange In Cash and equivalent	-28,940.08	
Net increase in cash and cash equivalents	59,329,631.65	-18,730,547.55
Add：Beginning balance of cash and cash equivalents	75,513,545.48	94,244,093.03
Final balance of cash and cash equivalents	134,843,177.13	75,513,545.48

2.3 Audit report of CPIYN

2.3.1 Original audit report 2012

BAKER TILLY
天|职|国|际 CHINA

审计报告

天职滇 SJ[2013]34 号

中电投云南国际电力投资有限公司：

我们审计了后附的中电投云南国际电力投资有限公司（以下简称"云南国际公司"）财务报表，包括 2012 年 12 月 31 日的资产负债表及合并资产负债表，2012 年度的利润表及合并利润表、所有者权益变动表及合并所有者权益变动表和现金流量表及合并现金流量表以及财务报表附注。

一、管理层对财务报表的责任

编制和公允列报财务报表是云南国际公司管理层的责任。这种责任包括：（1）按照企业会计准则的规定编制财务报表，并使其实现公允反映；（2）设计、执行和维护必要的内部控制，以使财务报表不存在由于舞弊或错误导致的重大错报。

二、注册会计师的责任

我们的责任是在执行审计工作的基础上对财务报表发表审计意见。我们按照中国注册会计师审计准则的规定执行了审计工作。中国注册会计师审计准则要求我们遵守职业道德守则，计划和实施审计工作以对财务报表是否不存在重大错报获取合理保证。

审计工作涉及实施审计程序，以获取有关财务报表金额和披露的审计证据。选择的审计程序取决于注册会计师的判断，包括对由于舞弊或错误导致的财务报表重大错报风险的评估。在进行风险评估时，注册会计师考虑与财务报表编制和公允列报相关的内部控制，以设计恰当的审计程序，但目的并非对内部控制的有效性发表意见。审计工作还包括评价管理层选用会计政策的恰当性和作出会计估计的合理性，以及评价财务报表的总体列报。

我们相信，我们获取的审计证据是充分、适当的，为发表审计意见提供了基础。

三、审计意见

我们认为，云南国际公司财务报表在所有重大方面按照企业会计准则的规定编制，公允反映了云南国际公司 2012 年 12 月 31 日的财务状况及合并财务状况以及 2012 年度的经营成果和现金流量及合并经营成果和合并现金流量。

1

[此页无正文]

中国·北京
二〇一三年 月二十

中国注册会计师：李雪琴

中国注册会计师：王蔚

2

2.3.2 Translation audit report 2012

Financial Statements' Special Instructions Audit Report

Baker Tilly Yunnan SJ[2013]34-1

CPI Yunnan International Power Investment Co. Ltd.：

We have audited the attached 2012 annual financial statements' special instructions (hereinafter referred to as special instructions) prepared by CPI Yunnan Power Investment Co., Ltd. (hereinafter referred to as CPIYN). In accordance with the State-owned Assets Supervision and Administration Commission (SAC) of State Council 《Notice on the central enterprises prepare 2012 annual financial statements and management reports》's (SAC Evaluation [2012] No. 183) requirements and relevant provisions (hereinafter referred to as SAC provisions), preparation of special instructions is the responsibility of the management of CPIYN, our responsibility is to express the audit opinion on the special instructions based on our audit.

We conducted our audit in accordance with the Auditing Standards for Chinese Certified Public Accountants. Those standards require that we comply with ethical requirements, plan and perform the audit to obtain reasonable assurance about whether the special instructions are free from material misstatement. An audit involves performing procedures to obtain audit evidence about the amounts and disclosures in the special instructions. We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our audit opinion.

We believe that CPIYN 2012 annual financial statements' special instructions are prepared in accordance with the provisions of the SAC in all major respects.

The audit report is only for CPIYN to submit the CPIYN 2012 annual financial statements' special instructions to the SAC, it shall not be used for other purposes.

2.3.3 Original audit report 2013

BAKER TILLY
天|职|国|际 CHINA

天职国际会计师事务所（特殊普通合伙）

审计报告

天职业字[2014]1884 号

中电投云南国际电力投资有限公司：

我们审计了后附的中电投云南国际电力投资有限公司（以下简称“云南国际公司”）财务报表，包括 2013 年 12 月 31 日的资产负债表及合并资产负债表，2013 年度的利润表及合并利润表、所有者权益变动表及合并所有者权益变动表和现金流量表及合并现金流量表以及财务报表附注。

一、管理层对财务报表的责任

编制和公允列报财务报表是云南国际公司管理层的责任，这种责任包括：（1）按照企业会计准则的规定编制财务报表，并使其实现公允反映；（2）设计、执行和维护必要的内部控制，以使财务报表不存在由于舞弊或错误导致的重大错报。

二、注册会计师的责任

我们的责任是在执行审计工作的基础上对财务报表发表审计意见。我们按照中国注册会计师审计准则的规定执行了审计工作。中国注册会计师审计准则要求我们遵守职业道德守则，计划和实施审计工作以对财务报表是否不存在重大错报获取合理保证。

审计工作涉及实施审计程序，以获取有关财务报表金额和披露的审计证据。选择的审计程序取决于注册会计师的判断，包括对由于舞弊或错误导致的财务报表重大错报风险的评估。在进行风险评估时，注册会计师考虑与财务报表编制和公允列报相关的内部控制，以设计恰当的审计程序，但目的并非对内部控制的有效性发表意见。审计工作还包括评价管理层选用会计政策的恰当性和作出会计估计的合理性，以及评价财务报表的总体列报。

我们相信，我们获取的审计证据是充分、适当的，为发表审计意见提供了基础。

二、审计意见

我们认为，云南国际公司财务报表在所有重大方面按照企业会计准则的规定编制，公允反映了云南国际公司 2013 年 12 月 31 日的财务状况及合并财务状况以及 2013 年度的经营成果和现金流量及合并经营成果和合并现金流量。

1

[此页无正文]

天职国际会计师事务所（特殊普通合伙）
中国·北京
二〇一四年三月五日

中国注册会计师：

中国注册会计师：

2.3.4 Translation audit report 2013

Financial Statements' Special Instructions Audit Report

Baker Tilly [2014]1884-1

CPI Yunnan International Power Investment Co. Ltd.：

We have audited the attached 2013 annual financial statements' special instructions (hereinafter referred to as special instructions) prepared by CPI Yunnan Power Investment Co., Ltd. (hereinafter referred to as CPIYN). In accordance with the State-owned Assets Supervision and Administration Commission (SAC) of State Council 《Notice on the central enterprises prepare 2013 annual financial statements and management reports》's (SAC Evaluation [2013] No. 244) requirements and relevant provisions (hereinafter referred to as SAC provisions), preparation of special instructions is the responsibility of the management of CPIYN, our responsibility is to express the audit opinion on the special instructions based on our audit.

We conducted our audit in accordance with the Auditing Standards for Chinese Certified Public Accountants. Those standards require that we comply with ethical requirements, plan and perform the audit to obtain reasonable assurance about whether the special instructions are free from material misstatement. An audit involves performing procedures to obtain audit evidence about the amounts and disclosures in the special instructions. We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our audit opinion.

We believe that CPIYN 2013 annual financial statements' special instructions are prepared in accordance with the provisions of the SAC in all major respects.

The audit report is only for CPIYN to submit the CPIYN 2013 annual financial statements' special instructions to the SAC, it shall not be used for other purposes.

2.3.5 Practicing certification of Baker Tilly



会计师事务所
执业证书

名　　称：	天职国际会计师事务所（特殊普通合伙）
主任会计师：	陈永宏
办公场所：	北京市海淀区车公庄西路乙19号华通大厦B座2层
组织形式：	特殊普通合伙
会计师事务所编号：	11010150
注册资本(出资额)：	1000 万元
批准设立文号：	京财会许可[2011]0105号
批准设立日期：	2011-11-14

证书序号：NO.006728

说　明

1、《会计师事务所执业证书》是证明持有人经财政部门依法审批，准予执行注册会计师法定业务的凭证。

2、《会计师事务所执业证书》记载事项发生变动的，应当向财政部门申请换发。

3、《会计师事务所执业证书》不得伪造、涂改、出租、出借、转让。

4、会计师事务所终止，应当向财政部门交回《会计师事务所执业证书》。

发证机关：北京市财政局

二〇一一年十一月十四日

中华人民共和国财政部制

3. Introduction to Royal Victory Services Co., Ltd.

Royal Victory Services Co., Ltd.

Company Name	:	Royal Victory Services Co., Ltd.
Address	:	No. (80), Boaungkyaw Road, Botataung Township, Yangon, Lower Myanmar.
		(Sa-58), 10th Road, Kywesekan, Pyigyitakun Township, Mandalay, Upper Myanmar.
Incorporation No. & Date	:	4586/2012-2013 (29-01-2013)
Export-Import Registration No.	:	HTA THA KA-30228 (28-03-2013)
Director List	:	U Zaw Win (Managing Director)
		U Kyi Kyain (Director)
Authorized Capital	:	Ks- 10,000,000,000/-
Foreign A/c No.	:	8001-1-03-03-000184-8, IBD Yangon (1), Ayeyarwady Bank
Local A/c No.	:	Myanma Economic Bank (3) (CR-000017), Mandalay
Type of Business	:	Services Company
		Trading/ Manufacturing/ Construction/ Services
		1. Product Transportation 2. Taunggoo Mining and Crusher Project 3. Chipwe Hydropower Project 4. Security Services 5. Fuel Trading

JOINT VENTURE AGREEMENT

AMONG

THE DEPARTMENT OF HYDROPOWER PLANNING

MINISTRY OF ELECTRIC POWER

THE REPUBLIC OF THE UNION OF MYANMAR,

CPI YUNNAN INTERNATIONAL POWER INVESTMENT

COMPANY LIMITED

THE PEOPLE'S REPUBLIC OF CHINA

AND

ASIA WORLD COMPANY LIMITED

THE REPUBLIC OF THE UNION OF MYANMAR

FOR

THE DEVELOPMENT,OPERATION AND TRANSFER

OF CHIPWI NGE HYDROPOWER PROJECT

IN

THE REPUBLIC OF THE UNION OF MYANMAR

2015

TABLE OF CONTENTS

1. DEFINITIONS AND INTERPRETATION .... - 5 -
2. WARRANTIES AND REPRESENTATIONS .... - 15 -
3. TERM .... - 17 -
4. DEVELOPMENT PLAN .... - 17 -
5. CONCESSION RIGHTS .... - 19 -
6. COMPENSATION PAYABLE BY THE JV COMPANY .... - 20 -
7. ESTABLISHMENT OF JV COMPANY .... - 21 -
8. CAPITAL STRUCTURE .... - 23 -
9. LIMITATION OF LIABILITIES .... - 26 -
10. PROJECT COST AND COST RECOVERY .... - 26 -
11. SHARE TRANSFERS .... - 28 -
12. FINANCE .... - 30 -
13. MANAGEMENT AND ADMINISTRATION OF THE JV COMPANY .... - 31 -
14. FINANCIAL ACCOUNTS, MANAGEMENT AND AUDITING .... - 35 -
15. TAXES .... - 38 -
16. INSURANCE .... - 42 -
17. RESPONSIBILITIES OF THE PARTIES REGARDING THE JV COMPANY .... - 42 -
18. FOSSILS AND ARTIFACTS .... - 49 -
19. DIVIDENDS .... - 49 -
20. FORCE MAJEURE .... - 50 -
21. SETTLEMENT OF DISPUTES .... - 51 -
22. CONFIDENTIALITY .... - 52 -
23. NOTICES .... - 52 -
24. WAIVER .... - 54 -
25. RENEGOTIATION AND MODIFICATION .... - 54 -
26. NON-ASSIGNMENT .... - 55 -
27. ENTIRE AGREEMENT .... - 55 -
28. SEVERABILITY .... - 56 -
29. ORIGINALS AND DUPLICATES OF THE AGREEMENT .... - 56 -
30. GOVERNING LAW .... - 56 -
31. WAIVER OF THE SOVEREIGN IMMUNITY .... - 56 -
32. TERMINATION .... - 57 -
33. CONDITIONS PRECEDENT .... - 58 -

JOINT VENTURE AGREEMENT

This Joint Venture Agreement (the "Agreement") is made and entered into in Nay Pyi Taw, The Republic of the Union of Myanmar, as of this day [20th] of [Jan 2015] by and among;

1) The Department of Hydropower Planning, under the Ministry of Electric Power of the Republic of the Union of Myanmar (hereinafter referred to as "MOEP)", a government department under the Government of the Republic of the Union of Myanmar and having U Thaung Han as its legal representative and its administrative address at Office No. 27, Nay Pyi Taw, the Republic of the Union of Myanmar (hereinafter referred to as "DHPP", which shall mean and include its successors and permitted assigns by the Government of the Republic of the Union of Myanmar);

2) CPI Yunnan International Power Investment Company Limited, a group company incorporated under the laws of the People's Republic of China (hereinafter referred to as "PRC") and having Mr. Li Guanghua as its legal representative and its registered address at 1302 Dianchi Road, Kunming, Yunnan, P.R.China, (hereinafter referred to as "CPIYN", which shall mean and include its successors legal representatives and permitted assigns); and

3) Asia World Company Limited, a company incorporated under the laws of the Republic of the Union of Myanmar, having U Htun Myint Naing as its legal representative and its registered address at No. 61/62 Bahosi

Development, Wardan Street, Yangon, the Republic of the Union of Myanmar (hereinafter referred to as "AWC", which shall mean and include its successors and permitted assigns).

(Each of DHPP, CPIYN and AWC shall be singularly referred to as a "Party" and collectively referred to as the "Parties" in this Agreement.)

WHEREAS

A. The Republic of the Union of Myanmar is the sole owner of all natural resources within her territory and has the right to develop, exploit and utilize the natural resources in the interest of the people of the Republic of the Union of Myanmar;

B. The Contract No. (68)/DHPI/2007-2008 (hereinafter referred to as "the Contract") for construction power project (Chipwi Nge) which was intended to be developed non-commercial nature for supplying and distributing the electricity for the development of hydropower projects in Maykha, Malikha and upstream of Ayeyawady-Myitsone River Basins (hereinafter referred to as "the Projects"), had been signed between Department of Hydropower Implementation, Ministry of Electric Power No. (1) (hereinafter referred to as "DHPI")and China Power Investment Corporation (hereinafter referred to as "CPI") on 27th February 2008.

C. The Parties agree that the Contract Shall be automatically dissolved on the date on which the Joint Venture Agreement has become effective.

D. The Ministry of Electric Power No. (1) and Ministry of Electric Power No. (2) had been merged into Ministry of Electric Power in 5th September 2012 so as to further promote in developing power sector in Myanmar.

E. The Memorandum of Agreement for the development, operation and transfer of the hydropower projects in Maykha, Malikha and Up-stream of Ayeyawady-Myitsone river basins (hereinafter referred to as "MOA") signed between MOEP and CPI on 16th June 2009.

F. The Parties have the right to follow the provision stipulated in the Supplementary Agreement to MOA (hereinafter referred to as "Supplementary Agreement") signed between Department of Hydropower Planning (hereinafter referred to as "DHPP") and CPIYN on (20th) (Jan.) 2015.

G. DHPP, a government department under MOEP, is responsible for planning of exploration, development and production of hydroelectric power within the Republic of the Union of Myanmar, and has the right for coordination with Department and Enterprise under MOEP to carry out and operate all hydroelectric power projects, and has been authorized by the Government of the Republic of the Union of Myanmar to execute this Agreement and to develop the Project.

H. The National Energy Administration of the People's Republic of China and MOEP, on behalf of their respective governments, had signed the Framework Agreement on Joint Development of Hydropower Resources in

Myanmar on 26th March 2009 (hereinafter referred to as the "Framework Agreement") in Nay Pyi Taw, setting up the policy framework for supporting the cooperation and development of the Project.

I. CPIYN, a state-owned clean energy enterprise registered in P.R.C, has outstanding experience and achievements in the development, construction and operation in the area of hydropower project, CPIYN (including its predecessor) has successfully implemented the Project.

J. AWC, an enterprise incorporated in the Republic of the Union of Myanmar, which has some experience and capabilities in implementation of hydropower projects in Myanmar, is willing to jointly cooperate in the development of Chipwi Nge Hydropower Station in accordance with this JV Agreement.

K. DHPP, CPIYN and AWC, pursuant to the Supplementary Agreement to the MOA desire to incorporate a private limited liability company in accordance with the Myanmar Companies Act, 1914 and the Special Company Act, 1950 for the purpose of jointly developing the projects upon the terms and conditions set forth therein.

NOW THEREFORE IT IS HEREBY AGREED as follows:

1. DEFINITIONS AND INTERPRETATION

1.1 In this Agreement, unless the context otherwise requires the following terms (the first letters of which are each capitalized) shall have the following meanings:

Access Routes means all routes which are necessary or expedient to gain and maintain access to the Site or the Ancillary Facilities;

Affiliated Company means any limited liability company that is owned in whole or in part by CPIYN or AWC in any country or region;

Agreement means this Joint Venture Agreement, including the Annexes and Attachments attached hereto;

Ancillary Facilities means any facilities of the Project that are constructed by CPIYN, otherwise acquires right of use for or in connection with the Project to support the normal construction and operation of the Project Facilities, including roads, transportation, communication, water, power, housing, education, medical or other facilities that may or may not exist from time to time. Those permanent and fixed facilities that provide the services for the normal operation of the Project Facilities are the facilities to be transferred upon the end of the Project Term;

Articles means the Articles of Association to be adopted by the JV Company in the form set forth in Annex (2);

Authorized Share Capital means the registered capital of the JV Company;

Authorized Shares means all Shares which have been created whether subscribed and issued or not issued;

Board of Directors or **Board** means the Board of Directors from time to time of the JV Company;

Commercial Operation Date means the date on which the average daily

load of the Project reaches 70MW (70% of output) continuously and the actual revenue yearly up to break-even point for sale of electricity, and as officially approved by MOEP for starting commercial operation. The period before C.O.D is trial operation term, in which different value between tariff revenue and operation and maintenance cost, interest and management fee should be considered as project cost.

Confidential Information means the commercial details of this Agreement, the Concession Rights and all information which is received cr obtained by a Party during the negotiations and discussions preceding the execution of each such agreement of which is obtained by a Party after the execution of each such agreement, if such information is marked "Secret" or "Confidential" when it is so obtained or received, or it would be clear to a reasonable person under the circumstances that such information was confidential or otherwise commercially sensitive;

Concession Rights means the exclusive rights to be issued by the Government of the Republic of the Union of Myanmar to the JV Company, fully set forth in Annex (3) hereto, for the JV Company to develop, finance, construct, operate and manage the Project, together with all of the project rights for the JV Company to conduct and manage the business associated therewith, including selling substantially all of the electricity to be generated by the Project to relevant purchaser of MOEP in the Republic of the Union of Myanmar and to receive and disburse the revenues and enjoy the benefits thereof;

Contractor means (i) any Person (other than any natural person who thereby becomes an employee of the JV Company) with which the JV Company contracts for the project construction, and sale, lease or other supply or service in connection with project management; and (ii) any

subcontractor of any tier for any such construction, and sale, lease or other supply, provision, performance, work or service pursuant to a contract with any other contractor;

DHPP has the meaning set forth in the preamble;

Director means a member of the Board of Directors;

Dollar means the lawful currency of the United States of America;

Force Majeure: means acts of god, strikes, lockouts, industrial disturbances, explosions, fires, floods, earthquake, storms, lightning and any other causes similar to the kind herein enumerated which are beyond the control of either party and which by the exercise of due care and diligence either party is unable to overcome;

Foreign Currency : means any currency other than Kyat, including accounts and investments denominated in foreign currency;

GOM means the Government of the Republic of the Union of Myanmar, including the legislative, executive, judicial and administrative authorities and bodies of the Republic of the Union of Myanmar;

JV Company means Chipwi Nge Hydropower Company Limited, a limited liability company to be jointly incorporated by DHPP, CPIYN and AWC in accordance with the laws of the Republic of the Union of Myanmar (hereinafter referred to as "CNHC") pursuant to Clause 7 of this JV Agreement;

Kyat or **K** means the lawful currency of the Republic of the Union of Myanmar;

Laws and Regulations means all national laws, legislations, statutes, acts, ordinances, rules, orders, regulations, codes, directives, announcements and any other legally binding pronouncements of any Myanmar Governmental Authority from time to time in force and effect;

Loan or Debt Financing means the capital or loan made by Shareholders or financial institutions or any other similar financing institutions to JV Company for the development, construction, operation and maintenance and implementation of the Project.

Materials and Equipment means any goods, supplies, materials and equipment of any kind, including machinery, vehicles, aircraft, vessels, consumables, parts and components;

Memorandum means the Memorandum of Association to be adopted by the JV Company in the form set forth in Annex (1);

Ministry means the Ministry of Electric Power;

Myanmar Governmental Authority means the GOM and any ministry, department, agency, authority, corporation, commission, committee under direct or indirect control or administration of the GOM or its any states or provinces, any courts or tribunals in the Republic of the Union of Myanmar, the legislature thereof, any other similar entities;

Notice has the meaning set forth in Clause 23.1;

Out-of-Pocket Costs means the costs and expenses (other than Third Party Fees) incurred by or on behalf of DHPP, CPIYN and/or AWC related to the development of the Project, as verified and approved under Clause 10;

Party or Parties has the meaning set forth in the preamble;

Permit means all authorizations, approvals, permissions, licenses, or consents which are or may from time to time become necessary or appropriate pursuant to the Laws and Regulations for or ancillary to the formation, registration, incorporation or operation of the JV Company in accordance with this Agreement and the Articles and Memorandum or for or ancillary to Project Management, or the fulfillment of the purposes and intents of this Agreement and the Articles and Memorandum;

Person means any individual, juristic person, firm, company, corporation, joint venture, association, trust, unincorporated organization or body of persons, government, state, governmental authority or other agency of a government or state (whether or not having separate legal personality);

Power Purchase Agreements (PPA) means the long-term Power Purchase Agreements between the JV Company and the power purchasers of MOEP in the Republic of the Union of Myanmar providing for the sale to the above purchaser of substantially all of the agreed proportion of the capacity of, and the electricity to be generated by, the Project, to the agreed point in form and substance satisfactory to the Parties;

P.R.C. means the People's Republic of China;

Project means the hydropower project of installed capacity up to 99 MW which is located on Chipwi river, main tributary of Maykha river, Kachin State, the Republic of the Union of Myanmar. This project includes:

(i) the dam, reservoir, water intake, power tunnel, penstocks, flood releasing and sand flushing facility, power house, switchyard,

(ii) the Transmission Lines, and

(iii) the Ancillary Facilities,

(iv) any other Project Facilities that may or may not exist from time to time, and

(v) the Sites, together with any other additions or alterations to the foregoing which may become necessary or appropriate for the successful implementation of Project Management;

Project Assets means the Project Facilities, Ancillary Facilities, Transmission Lines, the Sites, the Project Funds, the Concession Rights and the Project Rights from time to time;

Project Cost means all of the estimated costs and expenditures borne and/or to be borne and incurred out of the Project Funds in or in connection with construction and development of the Project and ratified or approved by the Board of Directors;

Project Facilities means the permanent facilities of the Project including dam, reservoir, water intake, power tunnel, penstocks, transmission facilities, power house, and switchyard to be constructed at the Station Site;

Project Funds means all cash, accounts and other assets or investments of the JV Company (other than the Project Facilities, Ancillary Facilities, Transmission Lines, and Project Rights), whether in Foreign Currency or Kyat and whether located or held inside or outside of the Republic of the Union of Myanmar;

Project Management means the development, construction, operation and management of the Project, including (i) the Project Facilities, Ancillary Facilities, including the Transmission Lines and other possession of or rights to all other Project Assets; (ii) the management and conduct of the construction, operation and maintenance of the Project; (iii) the management of the Project Assets, operation and management of the business therewith, including selling substantially all of the capacity of and electricity generated by the Project to relevant power purchaser of MOEP, receiving and disbursing the revenues, and enjoying the benefits thereof as generally contemplated by this Agreement, and the Concession Rights and Project Rights; and (iv) all acts and things necessary or appropriate in the judgment of the JV Company for the conduct and furtherance of such activities;

Project Rights means all governmental permits and permissions, licenses, consents, approvals and authorizations and all other rights and leases to the JV Company pursuant to the Laws and Regulations which are or may from time to time be necessary or appropriate for or ancillary to the successful implementation of Project Management including (i) the formation, registration, incorporation or operation of the JV Company in accordance with this Agreement and the Articles and Memorandum, (ii) the development, construction, financing, operation and management of the Project, (iii) the conduct and management of the business associated with the Project, including selling substantially all of the capacity of and

electricity to be generated by the Project to relevant purchaser of MOEP and to receive and disburse the revenues and enjoy the benefits thereof, and (iv) the fulfillment of the purposes and intents of this Agreement;

Project Term means the term of this Agreement and the Concession Rights, which shall commence upon the satisfaction of the Conditions Precedent set forth in Clause 33 hereof and shall continue for a period of forty (40) years following the Commercial Operation Date. Should events beyond the reasonable control of either Party delay the construction and/or operation of the Project or delay performance by either of the parties to the Power Purchase Agreement of their respective obligations there under, the foregoing term shall be automatically extended by the duration of any such delay;

Shares mean any units of Shares into which the Authorized Share Capital of the JV Company is divided in accordance with the Articles and Memorandum;

Shareholder means any Person who is a holder of a share certificate acquired in accordance with the Articles and Memorandum and this JV Agreement;

Shareholder Advance means each advance of funds made to or on behalf of the JV Company by or on behalf of a Shareholder or Party as provided in Clause 10.3 and 10.4 of this Agreement, whether before or after the formation or capitalization of the JV Company;

Shareholder Contribution means the capital, which means Authorized Share Capital contributed by, and loan without interest, made by the Shareholders for the development of the Project;

Sites mean the Transmission Route, the Station Site and the sites of all other Project Facilities and Ancillary Facilities (including the Access Routes to the Station Site);

Special Board Resolution means a resolution of the Board of Directors which is passed in accordance with the Articles by a unanimous vote;

Station Site means the sites, including but not limited to the sites occupied by the construction and operation of the permanent facilities, including the dam, reservoir, water intake, power tunnel, penstocks, flood releasing and sand flushing facility, transmission facility, power house, and switchyard (within Myanmar) to be constructed and installed as part of the Project;

Static Investment means the project investment which shall be calculated by the price level collecting at a particular time (usually at a particular quarter of a year) with a standard pricing methodology in accordance with the laws, regulations, trade regime and market quotation;

Third Party Fees means the fees and expenses payable to third parties by or on behalf of DHPP, CPIYN and/or AWC for services or work related to the development of the Project, as verified and approved under Clause 10.4;

Transmission Lines means the transmission lines from the Station Site to the nearest substation in Myanmar as well as its Ancillary Facilities;

Transmission Route means the route for the Transmission Lines.

1.2 In this Agreement, unless the context otherwise requires, clause headings are inserted for ease of reference only and shall be ignored in the interpretation of this Agreement; references to Clauses, the recitals, the preamble and the annexes are to be construed as references to the Clauses, the recitals, the preamble and the schedules to this Agreement; any references to an enactment shall be deemed to include any statutory re-enactment thereof or any statutory modification thereof; words importing the singular shall include the plural and vice versa; references to the neuter gender shall include the masculine and feminine genders.

2. WARRANTIES AND REPRESENTATIONS

2.1 Each Party to this Agreement represents and warrants to the other that it is a legal Person duly authorized under the relevant laws and has the right, power, sound financial standing and authority to enter into this Agreement.

2.2 CPIYN and AWC hereby represent and warrant to DHPP that the execution, delivery and performance of this Agreement have been duly authorized by all necessary corporate actions of such Party under all laws and regulations applicable to it and this Agreement constitutes (or when

executed will constitute) valid and legally binding obligations enforceable against it in accordance with the terms set out, and also warrants to DHPP that there is no obstacle to the performance of this Agreement as far as his best knowledge.

2.3 DHPP hereby represents and warrants to CPIYN and AWC that its execution, delivery and performance of this Agreement has been duly authorized by the GOM under all laws and regulations applicable to it and this Agreement constitutes (or when executed will constitute) valid and legally binding obligations enforceable against it in accordance with the terms set out, also warrants to CPIYN and AWC that there is no obstacle to the performance of this Agreement as far as his best knowledge.

2.4 During the Project Term, Department of Hydropower Planning shall be responsible for security of the Project Site, Project related personnel and Project equipment, machinery, plants and materials and the normal operation of Project Management.

2.5 The parties agree that Ministry of Electric Power (MOEP) shall have right to purchase the electricity from Chipwi Nge Hydropower Station in terms of Power Purchase Agreement so as to fulfill the state power demands.

2.6 The parties agree if Upstream Ayeyawady Confluence Basin Hydropower Co., Ltd. (ACHC) needs to use the electricity from Chipwi Nge Hydropower Station to provide for the development of the Projects as construction power, ACHC could purchase directly from the JV Company after prior consent from MOEP is obtained. In order to increase the power

production of Chipwi Nge HPP, help the local business grow and improve local economy, the JV Company shall be permitted to conduct direct power supply services to the other large users who consume a large volume of electricity, build transmission lines connecting with the large users, and collect payment for the electricity sold to them after prior consent from MOEP is obtained so as to shorten the trial operation period and reduce the losses of the JV Company.

3. **TERM**

3.1 This Agreement shall come into effect upon the satisfaction of the conditions precedent set forth in Clause 33 hereof and shall continue until the expiration of the Project Term.

3.2 The (40) years of operation shall start from the Commercial Operation Date of Chipwi Nge Hydropower Station.

3.3 After the expiration of the concession period of Chipwi Nge Hydropower Station, the Project Company shall transfer the fully operational facility and maintain the facility in good conditions at no cost to DHPP or its successor.

4. **DEVELOPMENT PLAN**

4.1 Within 90 (ninety) days upon this Agreement becoming effective, CPIYN shall submit for the review and approval of the Board of Directors (i) a plan and schedule for implementation and development of the Project, and (ii) a budget for the expenses of such plan and schedule, the expenses of each Party with respect to their respective assignments as

contemplated by this Agreement and set forth in the foregoing development plan, and the other costs or contributions of each Party regarding the development of the Project. The plan, schedule and budget regarding the development of the Project shall be subject to regular review and revisions by the Board of Directors.

4.2 The Parties agree that fees and costs incurred by or on behalf of either Party in pursuing the development of the Project prior to the establishment and capitalization of the JV Company in accordance with the development plan and budget approved under Clause 4.1 above shall be reimbursed or credited to the Party which incurred such fees and costs in accordance with Clause 10.4.

4.3 The Parties agree that CPIYN shall be the overall Contractor to construct the whole Project under a turn-key contract, and shall be contracted for the operation and maintenance of the Project. It is also agreed that the said turn-key contract and the said contract for the operation and maintenance shall be signed between the JV Company and CPIYN within 120 days after the JV Company's establishment.

4.4 The JV Company shall implement the survey, design, testing, quality control, operations, management, inspection, repair and maintenance and related works of the Project in accordance with standards and criterions as approved by MOEP and may support such activities with other international standards and specifications whenever and wherever necessary.

4.5 Related works of the project due to Terms and Conditions stipulated in this contract shall be approved by the Board of Directors of the JV Company. After such approval is made, the JV Company shall officially notify MOEP.

4.6 Transmission network for transmitting electricity from Chipwi Nge Hydropower Station to Myanmar and to construct the transmission line to the nearest sub- station in Myanmar as well as its ancillary facilities and those expenses must be borne by the project company, however the total project cost will not be allowed to revise.

4.7 JV Company is solely responsible for completely undertaking the works related to environmental, social impact as well as resettlement of the local people in the project area in line with the GOM's policy and the costs incurred to be borne by JV Company.

5. **CONCESSION RIGHTS**

5.1 Upon this Agreement becoming effective in accordance with Clause 33 hereof, and the JV Company having been duly incorporated, DHPP shall procure the issuance of the Concession Rights by the GOM in form and substance as set forth in Annex (3).

5.2 The Concession Rights, issued as such pursuant to the terms of this Agreement, shall not be revoked except in accordance with the terms hereof.

5.3 The Concession Rights shall become immediately effective upon issuance

and shall continue in effect until the earlier to occur of (i) termination or expiration of this Agreement, and (ii) the expiration of the Project Term. Upon the expiration of the Concession Rights, the Parties shall cause the JV Company to promptly transfer Project Facilities to DHPP or its successor or such nominee as DHPP or its successor may select free of charge. After transfer of all the Project Facilities, Chipwi Nge hydropower station and payment of such compensation, the JV Company shall be winding up and dissolved in accordance with its Articles and Myanmar Companies Act.

6. **COMPENSATION PAYABLE BY THE JV COMPANY**

6.1 In consideration for the grant and issuance of the Concession Rights to the JV Company, the Parties shall cause the JV Company to:

a) pursuant to the Supplementary Agreement, provide to DHPP, free of charge as a royalty payment and without any further consideration, Shares equal to 15 % (fifteen percent) of the total Authorized Share Capital of the JV Company. This 15 % shall be in no case increased.

6.2 DHPP shall not take the right to purchase more Shares from the JV Company in addition to its free share as royalty fee.

6.3 Other than the compensation specified in Clause 6.1, it is the intention of the Parties that the JV Company shall not be required to pay any separate rent, Royalty Payment or other consideration of any kind to DHPP

or any other Person with respect to its exclusive rights to design, finance, construct, complete, operate, maintain and manage the Project and Project Assets, Concession Rights, Project Rights and to supply and sell all and/or part of the capacity of and electricity to be generated by the Project in the Project Term.

7. **ESTABLISHMENT OF JV COMPANY**

7.1 The JV Company is formed pursuant to the Articles and Memorandum as set out in Annex (1) and (2) of this Agreement, the Myanmar Foreign Investment Law, the Myanmar Companies Act, 1914 and the Special Company Act, 1950. As the legal entity to develop the Chipwi Nge Hydropower Station on Chipwi River in the Republic of the Union of Myanmar, the JV Company is fully entitled to all the rights pertinent with the Project Management of Chipwi Nge Hydropower Station.

7.2 a) The objectives of the JV Company shall be to plan, design, finance, construct, operate, maintain and manage the Project Facilities, Project Assets and conduct the Project, primarily for the sale of substantially all of the capacity of and electricity generated by the Project under the Power Purchase Agreement based on the sound commercial and industrial practices consistent with the foreign investment incentives provided under the policies and laws of the Republic of the Union of Myanmar.

b) The objectives of the JV Company shall also include participation in

other projects which may make use of the Project or the Project Rights.

c) Subject to the terms of other subsequent agreements among the Parties hereto entered into pursuant to this Agreement, the JV Company's objectives may also include participation in other power sector projects in the Republic of the Union of Myanmar provided that the consent of the GOM to such participation is obtained.

7.3 The JV Company shall be a limited liability company where the liability of its Shareholders is limited to the nominal value of the Shares respectively held by them.

7.4 The name of the JV Company upon its incorporation shall be the Chipwi Nge Hydropower Co., Ltd.

a) The registered office of the JV Company shall be located at Nay Pyi Taw, the Republic of the Union of Myanmar;

b) The JV Company may in addition to the registered office open and maintain branch office(s) and/or site office(s) as the Board of Directors shall determine.

7.5 The Parties hereby agree that, in the event of any difference or conflict between the Articles/Memorandum and this Agreement, this Agreement shall prevail, and, in such event, the Articles/Memorandum shall be interpreted and/or deemed to have been amended to conform to this Agreement, and the Parties shall cause the JV Company to amend the

Articles/Memorandum to be in conformity with the terms of this Agreement.

7.6 The Parties hereby agree that, in the event of any difference or conflict with respect to this Project between any previous agreement or any previous document signed by DHPP and this Agreement, this Agreement shall prevail.

8. **CAPITAL STRUCTURE**

8.1 a) The share capital of the JV Company shall be denominated in Dollars. The final Authorized Share Capital of the JV Company shall be US$ 1,000,000 (One Million Dollars only) which shall be divided into 10,000 (Ten thousand Shares only). The par value of each Share shall be US$ 100 (One hundred Dollars).

b) The authorized Shares shall be subscribed by CPIYN and AWC, ninety four point twelve percent (94.12 %) of which shall be subscribed by CPIYN and five point eighty eight percent (5.88 %) by AWC, fifteen percent (15 %) of the authorized Shares shall be allotted to DHPP as the royalty payment according to Clause 3.1.6 of the MOA and Clause 6.1(a) of this Agreement. The subscription amount and percentage of Shares allocated to each party respectively are as follows:

Shareholder	Proportion of Subscription	No. of Shares	Subscription Amount(USD)	Percentage of Shareholding
CPIYN	94.12 %	8,000	941,200	80 %
DHPP	0	1,500	0	15 %
AWC	5.88 %	500	58,800	5 %
Total	100 %	10,000	1,000,000	100 %

c) The initial issue and paid-up share capital of the JV Company shall be US$ 100,000 (One hundred thousand Dollars), divided into 1,000 (One thousand Shares). CPIYN and AWC's initial paid-up Shares shall be subscribed within ninety (90) days after this JV Agreement comes into effect, and this period may be extended with the prior mutual consent of the Parties if necessary. DHPP's initial paid-up Shares shall be subscribed according to Clause 6.1(a) and 6.2.

d) The ownership of the Shares, subscribed by and issued (or to be issued) to CPIYN or AWC may be allocated with the negotiation of the Parties to the Affiliated Company or any other Person who undertakes to invest in or finance the Project as required by CPIYN or AWC, provided, however, that CPIYN or AWC shall ensure that the Affiliated Company or the Person, allocated ownership of such Shares must sign the relevant document to abide by the terms and conditions of this Agreement.

8.2 Save as otherwise expressly set forth in this Agreement, the Articles and Memorandum or any amendment thereto, all Shares of the JV Company shall have the same rights and carry the same obligations, excluding those mentioned in Clauses 8.6 and 8.8.

8.3 Subject to Clause 6.1 and 6.2, the final proportion of total Shares for DHPP in the JV Company shall be 15 % (fifteen percent) Shares as royalty payment, and in no case shall be increased.

8.4 The Authorized Share Capital of the JV Company may only be increased and the Shares may only be issued upon the Special Board Resolution.

8.5 The Shareholders shall pay for the Shares issued to them by:

a) cash payments in Dollars or any other foreign currency agreed by the Parties;

b) exchange of such issued Shares for the credits envisioned by Clause 10.3 and 10.4;

c) evaluating the equipment and/or facilities necessary to the Project in terms of money; or

d) by such other means as may be agreed between the Parties.

8.6 Subject to Clause 6.2, in accordance with clause 8.1(b) DHPP shall have a total of 15 % of rights to vote and dividend distribution and 15 % of right to assets distribution in the JV Company.

8.7 The depreciation shall be taken linearly as 4 % per year after the Commercial Operation Date of the hydropower station.

8.8 The depreciation value withdrawn by the JV Company each year shall be used to repay the principle of JV Loans and to recover the Shareholder

Contribution (excluding the Authorized Share Capital) of the Shareholder according to the proportion of their respective Shareholder Contribution (excluding the Authorized Share Capital).

9. **LIMITATION OF LIABILITIES**

The JV Company shall be a juristic person independent from each of the Parties. None of the Parties will be liable for any debts, obligations or other liabilities of the JV Company. The liability of each of the Parties (in and arising from its capacity as a Shareholder) to the JV Company, the JV Company's Creditor and Persons having claims against the JV Company shall be limited to payment for the unpaid portion of the Shares in the JV Company already subscribed or which such Parties have unconditionally agreed to subscribe and in which the rights of the respective Shareholders to participate in profits of distributions, whether on a winding-up or otherwise are, in the absence of provisions to the contrary contained herein, in proportion to the number of Shares held by them.

10. **PROJECT COST AND COST RECOVERY**

10.1 The percentage of contributions for financing the Project shall be as follows:

Shareholder Contribution (including Authorized Share Capital)		30%
Loan		70%
	Total:	100%

10.2 The Shareholders shall ensure the JV Company will obtain the Loan as per the proportion listed above. The actual net interest rate (without the withholding tax levied in the Republic of the Union of Myanmar) of long term commercial bank loan in P.R.C at the time of loan financing shall be applied.

10.3 All the works, services and payments made and/or done by CPIYN in accordance with the development plan and budget approved by the Board of Directors before the establishment of the JV Company for the construction of the Project shall be reimbursed or credited to CPIYN after the establishment of the JV Company.

10.4 All Third Party Fees and Out-of-Pocket Costs which have been or may be properly incurred and paid by or on behalf of a Party and which:

i) are ratified or approved by the Board of Directors;

ii) are incurred in the establishment of the JV Company or on behalf of the JV Company and the JV Company agrees to pay such Third Party Fees or Out-of-Pocket Costs to such Party or any affiliate of such Party by Special Board Resolution or upon the approval of the Shareholders;

shall be deemed as Shareholder Advances to the JV Company by the Party which bears the same from the date of payment of the funds in question on behalf of the JV Company. The principal amount of the aggregate of all such Shareholder Advances from

the Parties, shall either be repaid by the JV Company to the Parties from the first draw under the Debt Financing for the Project, or from the first funds (other than the Shareholder Contribution) which may otherwise become available to the JV Company for that purpose, or credited against the price payable for Shares to be issued to the Parties in accordance with this Agreement upon the issuance thereof. Whether such sums are to be so repaid or so credited, and, if to be repaid, from what funds, shall be determined by Special Board Resolution.

10.5 Including insurance fee, the interests of construction loan, the calculated and affirmed construction fee is 1.329 billion RMB, and the estimated total cost of this project is 1.49 billion RMB. The expenditure of the power station to be used until COD had been covered in the total project cost and the parties agreed that the project cost will be mutually reapproved by the parties if COD is confirmed whatever later or earlier than the end of the year 2017.

11. SHARE TRANSFERS

Subject to and without restriction regarding the rights CPIYN or AWC pursuant to Clause 8.1(d), the Shareholders shall only sell or transfer its Shares to:

a) CPIYN or AWC's Affiliated Company, provided where the transferor has not been paid for its Shares, the transferor shall, remain liable for all its obligations under the Articles and Memorandum and this Agreement, as if such transfer had not been made; and

b) a corporate entity which is able to evidence to the reasonable satisfaction of all other Shareholders that, at the time the relevant sale or transfer of Shares takes effect, it has or will have the legal, financial and technical status and capability necessary or otherwise appropriate to perform all obligations of a Party to this Agreement, and is otherwise a financially responsible Person and in a block representing at least (7.5 %) Seven Point Five percent of the then Authorized Share Capital of the JV Company or all of such Shareholder's Shares if it owns less than (7.5 %) Seven Point Five percent of the then Authorized Share Capital of the JV Company, provided that before selling or transferring such Shares to such a corporate entity, the relevant Shareholder shall have offered them for sale to the other Shareholders in accordance with the requirements of Clause 11 of the Articles of Association set forth in Annex (2).

c) AWC shall have the option to purchase from CPIYN a further 15 % (fifteen percent) of the total shares of the JV Company within 5 (five) years from the commencement of commercial operation of this Project (hereinafter referred to as "Option Shares"). Price for such Option Shares to be purchased by AWC shall be assessed and fixed on a fair market value. This entitlement of acquiring 15 % (fifteen percent) of shares shall only be exercised by AWC, and shall not be

transferred to any third party. If AWC intends to transfer these shares within 5 (five) years of such acquisition, CPIYN shall be entitled to acquire those shares as per the funding costs of AWC for such shares (i.e. capital paid for such shares plus the interests thereof). If AWC intends to transfer these shares after aforesaid 5 (five) years of its acquisition, CPIYN has a pre-emptive right to acquire those shares.

d) The Shares held by DHPP may be transferred only to the successor ratified by the GOM, provided that DHPP and such successor shall sign relevant documents in conformity with the terms and conditions of this Agreement.

12. FINANCE

12.1 CPIYN shall propose for selection a financial advisor or advisors for the JV Company on terms and conditions to be approved by the JV Company.

12.2 The JV Company, after informing the Directors and giving them an opportunity to participate, and acting pursuant to approval from the Directors and Shareholders and co-operating with an approved financial advisor, shall make arrangements for borrowing an amount that is sufficient to meet the Project's Debt Financing requirements.

12.3 Financing of Loan for the Project shall be obtained by JV Company with assistance of the Shareholders. The JV Company shall commit to repay such Loan in accordance with agreed repayment method and pledge its assets and rights to support or secure any borrowings and Loan.

13. MANAGEMENT AND ADMINISTRATION OF THE JV COMPANY

13.1 The General Meeting of the Shareholders is the highest organ for the power of the JV Company, and the General Meeting is entitled to authorize the Board of Directors or any professional management staffs to manage the JV Company or to conduct the construction, management, maintenance of the Project. The General Meeting is also entitled to discuss and decide any issue of the JV Company if it thinks necessary. The proceedings at General Meeting will be defined in Annex (2) Articles of Association.

13.2 Detailed provisions as to the management and administration of the Project by the JV Company shall be included in the Articles and Memorandum.

13.3 The JV Company shall minimize the social and environmental impacts caused by the Project and Project Management and limit such impacts within the territory of the Republic of the Union of Myanmar.

13.4 Unless otherwise decided upon unanimous decision of the Shareholders:

a) there shall be 9 (nine) Directors, each with a term of office of 3(three) years;

b) the directors are elected by the general meeting of shareholders, among which CPIYN shall be entitled to nominate 6 (six) directors, AWC shall be entitled to nominate 1 (one) director, and MOEP shall be entitled to nominate 2 (two) directors; and

c) a Shareholder who nominates a Director shall be entitled to replace that Director from his position with a new Director by a written notice.

13.5 The Chairman of the Board of Directors shall be elected by a simple majority vote of the Directors. The Managing Director shall be appointed by a simple majority vote of the Board of Directors upon the nomination of CPIYN.

13.6 The Chairman or any two Directors shall be entitled to call meetings of the Board of Directors in accordance with the procedures set forth in the Articles of Association. The quorum for any such meeting shall be at least 6 (six) Directors, with each Shareholder being required to be represented by at least 1 (one) Director who has been nominated by it.

13.7 The JV Company shall maintain books, accounts and statements in Dollar and in English in accordance with Laws and Regulations and internationally generally accepted accounting principles. The JV Company's books and accounts and records, as well as its minute books, register of Shareholders, register of Directors and other statutory records shall be kept under the control and custody of the Board of Directors.

13.8 The Managing Director shall have the authority to do the following acts and things for and on behalf of the Company:

(a) to exercise signature powers determined by the Board of Directors; PROVIDED that:

(i) the Managing Director shall in any case have the signature powers sufficient to meet all recurrent monthly expenses.

(ii) the Managing Director shall have full power and authority to enter into any contract or transactions involving a financial commitment of up to US$ 200,000 (Two hundred thousand US dollars); and

(iii) the Managing Director shall have full power and authority to enter into any contracts or transactions involving a financial commitment of between US$ 200,000 (Two hundred thousand US dollars) and US$ 1,000,000 (One million US dollars) provided that the Managing Director in such case notifies all the Directors of the Board in advance by the fastest possible means (including by e-mail or fax) of such intended commitment, and if no objection is made by any of the Directors within a week of such written notice, the Managing Director will be entitled to proceed with the intended commitment.

13.9 The following actions of the JV Company shall require a Special Board Resolution:

a) disposal of all or substantially all of the assets of the JV Company;

b) embarking upon or engaging in any project other than the Project or making or permitting any material change in the nature or the JV Company's business or in the geographical area of its operations;

c) amendments to or alterations of the Articles and Memorandum and this Agreement;

d) waiving or relinquishing, or agreeing to waive or relinquish any right, power, privilege or remedy pursuant to the Concession Rights; and

e) selecting or altering the selection of the sites for the Project or the Transmission Route.

f) entering into, varying or terminating any agreement between the JV Company and any of the Parties or any Person affiliated with any of the Parties;

g) to increase or decrease in the Share Capital of the JV Company;

h) borrowings or receiving a loan in excess of US$ 200,000 (two hundred thousand US dollars only) to be secured by the property of the JV Company;

i) issuing a guarantee for an amount in excess of US$ 200,000 (two hundred thousand US dollars only);

j) creating any charge or granting any security on the assets of the JV Company of an amount in excess of US$ 200,000 (two hundred thousand US dollars only);

k) leasing of land valued in excess of US$ 200,000 (two hundred thousand US dollars only); and

l) approval of annual accounts or adoption of accounting practices.

Provided, however, that the Special Board Resolutions cannot authorize any act which violates or is contrary to the terms of this Agreement.

Except such actions set above, other actions of the JV Company shall be approved by a majority vote of the Board of Directors.

However, such actions which has been included in development plan and budget and approved under Clause 4.1 will not require a Special Board Resolution.

13.10 Each Shareholder shall for as long as, it holds at least 10 % (ten percent) of the issued and outstanding Shares have the right at its own expense to review and inspect the JV Company's books, accounts and records and to arrange for audits in addition to the statutory annual audit, the JV Company and the other Shareholders shall cooperate with any such audit.

13.11 As long as DHPP or its affiliate is a Shareholder the Board may, at the request of DHPP, appoint a consultant to the Board who shall be entitled to receive notice of and attend meetings of the Board without voting right. The Board may, by Special Board Resolution, appoint such other consultants to the Board and/or invite any other Person to attend meetings of the Board of Directors without voting right as it considers appropriate.

14. FINANCIAL ACCOUNTS, MANAGEMENT AND AUDITING

14.1 The Parties shall ensure that all moneys received by the JV Company from the sale of electricity, all funds received by the JV Company in payment for Shares issued by the JV Company and any other funds received by the JV Company outside of the Republic of the Union of Myanmar shall be received in a foreign currency and shall be deposited

into such bank account or accounts in the name of the JV Company outside the Republic of the Union of Myanmar as shall from time to time be established and designated, and in such foreign currency as shall from time to time be designated, by the JV Company, including any such account or accounts outside of the Republic of the Union of Myanmar into which any such funds are to be deposited pursuant to any agreement for the provision of Debt Financing to the JV Company for the conduct of the Project.

14.2 Funds in the account or accounts referred to in Clause 14.1 and all other revenues of the Project shall, subject to Clause 14.3, be disbursable for the following purposes, which purposes shall have precedence in the following order:

i) directly to meet the operating expenses and depreciation money of the JV Company and the expenses required by the project construction or into any accounts (which accounts, in the case of expenses in foreign currency, shall be accounts established in accordance with Clause 14.1 and, in the case of expenses in Kyat shall be accounts established in the Republic of the Union of Myanmar) designated for this purpose to meet such expenses which have fallen due or will fall due in the following 30 (thirty) days;

ii) to meet debt service repayments whether of principal, interest, fees or expenses related thereto;

iii) to recover Shareholder Contribution other than the Authorized Share Capital on the proportion of each Shareholder's Contribution (excluding the Authorized Share Capital);

iv) to deposit a reserve, as may be required or determined by the financiers of the JV Company, into any debt service reserve account, including a reasonable reserve for operating and maintenance, expenses of the JV Company and for other foreseeable contingencies;

v) to pay taxes to the Republic of the Union of Myanmar in accordance with Laws and Regulations;

vi) as authorized by a Special Board Resolution, to meet capital expenses of the JV Company;

vii) to make any other payments in accordance with the provisions of this Agreement; and

viii) to pay dividends approved in accordance with the provisions hereof to the Shareholders.

14.3 It is recognized by the Parties that the financiers of the JV Company may require arrangements other than those envisaged by Clauses 14.1 and 14.2. In such event, the Parties will endeavor to adhere as closely as possible to the provisions of Clauses 14.1 and 14.2 whilst meeting the requirements of such financiers.

14.4 The auditors of the JV Company shall be appointed in accordance with the provisions of Section 145A of the Myanmar Companies Act, 1914.

15. TAXES

15.1 a) The JV Company shall be subject to taxation and with respect to this Project, the following taxes shall be levied on and payable by the JV Company or any Person who is liable to pay any taxes under Laws and Regulations:

i) The Commercial Tax shall be exempted 3 (three) years (36 months) consecutively starting from the date of the Commercial Operation Date of the Project. After that, Commercial Tax shall be payable at the rate of 5 % (five percent) on export proceeds or services and local sale in foreign currency;

ii) The Income Tax shall be exempted 5 (five) years (60 months) consecutively starting from the Commercial Operation Date of the Project at the rate of 25 % (twenty five percent). And the Income Tax payable by the JV Company after exemption period shall be paid in foreign currency by calculating according to the Ministry of Finance's Order No. (111/2012).

iii) The Company shall withhold Income Tax at the rate of 15 % from the payment of interest to non-resident foreigner on the interest accrued from loans;

iv) 3 % withholding tax shall be deducted by the JV Company from its payment to Myanmar citizen and resident foreign contractor and sub-contractor, in case of non-resident foreign contractor, 3.5 % withholding tax shall be deducted;

v) 10 % (ten percent) Income Tax on salaries earned in terms of foreign currency by employees and directors of the Company, which tax is to be deducted by the Company from the assessable income of the persons concerned;

vi) Full amount of custom duty in local currency for the drawback items of imported property must be deposited with the Customs Department. Upon the withdrawal of such draw-back items, 1/8 (one eighth) of the total deposited amount shall be transferred to the accounts of the Customs Department and the remaining portion of 7/8 (seven eighths) shall be refunded, as far as those shipments are complied with the provisions of Sea Customs Act Section 42 and 43;

vii) After the payment of Income Tax, there shall be no corporate tax unless the JV Company has other source of income in Kyats;

viii) There shall be no taxes or any other levy on dividends of the JV Company;

ix) If income is received in foreign currency, the related taxes shall be paid in foreign currency. If income is received in Kyat, the related taxes shall be paid in Kyat;

b) In the event that the JV Company shall have to pay taxes other than those, assessable on the JV Company, or taxes the rate or the amount of which is more than that is payable by the JV Company, under sub-Clause 15.1 (a), the amount of tax so paid or over-paid by

the JV Company shall be deducted from the dividend or any payment by the JV Company to DHPP.

15.2 Payments to the Shareholders from the JV Company by way of dividends, or repatriation or remittances of profit or capital of the Shareholders shall not be subject to tax, whether such payments are made in cash or in kind, and whether they are received before or after the JV Company's dissolution and whether they are repatriated or not.

15.3 Promptly after the execution of the Agreement, the Parties shall apply and submit this Agreement and the related documents to the Myanmar Investment Commission and other appropriate Myanmar Governmental Authority in order to obtain the maximum exemption or relief allowed by the Republic of the Union of Myanmar Foreign Investment Law, and any other applicable domestic Tax Laws and Regulations of the Republic of the Union of Myanmar to the JV Company, including, but without limitation, the following exemptions:

a) relief from or refund income tax on profits of the Project and Project Management if such profits are maintained in a reserve fund for development of the JV Company and re-invested within one year after the reserve is created;

b) the right to accelerate depreciation on machinery, equipment, building or other capital assets, used in the Project and Project Management at a rate approved by the Myanmar Investment Commission to the extent of the original value for the purpose of income-tax assessment;

c) the right to pay Income Tax on behalf of foreign employees and to deduct such payment from the assessable income;

d) the right to pay Income Tax on the income of foreign employees at the rates applicable to the citizens residing within the country irrespective of their stay in the Republic of the Union of Myanmar.

e) the right to deduct from the assessable income the expenses incurred in research and development relating to the enterprise which are carried out within the Republic of the Union of Myanmar;

f) the right to carry forward and offset losses up to three consecutive years from the year the lose is sustained;

g) exemption or relief from custom duty or other internal taxes or both on machinery, equipment, instruments, machinery components, vehicles, spare parts and materials used in the construction of the Project;

h) exemption or relief from custom duty or other internal taxes or both on the materials and spare parts imported and required for the construction and normal operation of the Project for the first three years following the Commercial Operation Date of the Project;

i) the tax holiday.

15.4 The Parties shall apply for any further exemption or relief that may become available to the JV Company under Laws and Regulations prevailing at that time. Since the Project is a special case, the Parties agree to apply for exemption of all the taxes allowed by the Republic of the Union of Myanmar Foreign Investment Law and any other applicable

domestic Tax Laws and Regulation of the Republic of the Union of Myanmar for construction and trial operation periods (before the Commercial Operation Date).

15.5 All import tariffs, income taxes and commercial taxes imposed or exempted on export proceeds or services and local sale, payment of interest, payment to contractors and sub-contractors, salaries earned by employees and directors of the Company and payment for consulting services in the Republic of the Union of Myanmar shall be applied in acccrdance with relevant laws, rules and regulations of the Republic of the Union of Myanmar.

16. INSURANCE

The JV Company shall obtain and maintain, or cause other to obtain and maintain insurance coverage for the Project throughout the Project Term that is consistent with industry practices regarding the development, construction and operation of privately owned limited recourse Debt Financing power projects. To the extent available and consistent with the need to finance the Project on a limited recourse basis and the ability to reinsure same through the international insurance market on Terms and Conditions customary for privately owned power generation project, such insurance shall be sourced from or through Myanmar Insurance or other foreign insurance company. The types of insurance to be obtained by the JV Company with respect to the Project shall be such as the Board of Directors may decide from time to time in accordance with the foregoing and the Republic of the Union of Myanmar Foreign Investment Law and Procedures there under.

17. RESPONSIBILITIES OF THE PARTIES REGARDING THE JV COMPANY

17.1 (a) The Parties shall use best efforts to assist the JV Company in obtaining all authorizations, permissions, right, approvals, consents, decrees and licenses required or otherwise appropriate for the

Project; the JV Company shall be responsible to compensations or other fees or charges as required by the Laws and Regulations for resettlement required for the development, construction, operation and maintenance of the Project. The Parties shall use best efforts to ensure the expense in the resettlement shall not exceed 1 % (One percent) of the Static Investment of the Project.

(b) Regarding the conducting for corporate social responsibility of the project, the parties agree that at least one percent (1 %) on annual net profit of power station will be set up as an official fund so as to continuously provide necessary assistance to the people who suffer the impacts caused by the project implementation works.

17.2 The JV Company and its personnel shall comply with Laws and Regulations and shall not intentionally interfere in the internal affairs of the Republic of the Union of Myanmar during the duration of their stay within the Republic of the Union of Myanmar.

17.3 All the equipment, technology and designs involved with the Project are each of independent intellectual property rights, including patents, trademarks, technical know-how, and/or other form of intellectual property rights. Each owner of such intellectual properties relating to the equipment, technology and designs have neither authorize any person or entity who are not involved with the Project to use such intellectual properties, nor authorize any person (including the Parties of this Agreement and the JV Company) to use such intellectual properties for any purposes other than those specified in the Project. Both Parties and the JV Company have obligations to pay special attention on protecting the intellectual properties of their respective owner and ensure to treat as secret and confidential the intellectual properties.

17.4 The parties shall do their best to promote and help to reach agreements

for joint development of hydropower resources in Myanmar and agreements on avoidance of double taxation between the governments of Myanmar and China.

17.5 The Parties shall assist the JV Company to negotiate the PPA (s) with potential Myanmar Power Purchaser of MOEP for the sale of electricity; the price of electricity in PPA(s) with Myanmar Power Purchaser of MOEP shall be negotiated and determined according to the actual circumstance. For the development of hydropower projects in Maykha, Malikha and Upstream of Ayeyawaddy-Myitsone River Basins, CPIYN can make proposal to MOEP, requesting MOEP to sell the necessary amount of electricity to the hydropower projects for construction power in terms of PPA. MOEP shall give necessary understanding and positive support. Parties agree that tariff for selling and purchasing electricity generated from Chipwi Nge hydropower plant is to be negotiated.

17.6 CPIYN shall be responsible for the following:

a) Arranging Debt-Financing for the JV Company in accordance with this Agreement;

b) Providing general management, accounting and financial management services to the JV Company (or arranging for such management services) under a contract with the JV Company;

c) Entering into contract with JV Company for overall contracting at turn-key basis of the construction of the Project; and

d) Entering into a contract with JV Company for contracting of the operation and maintenance of the Project.

17.7 DHPP shall be responsible for the following:

a) acquiring in its own name the land and water resources and relocating and arranging relevant original owners or interested parties, required to be utilized for the Project and then transfer the land and water resources, required to be utilized for the Project and transfer the land, water resources to the JV Company under a valid document. The consideration for such transfer shall be the compensation provided to and the rights afforded to DHPP pursuant to Clause 6 hereof.

b) procuring Permits for such land to be utilized by the JV Company for industrial purposes under Sections 38 and 39 of the Land Nationalization Act;

c) if the land required to be acquired on behalf of the JV Company includes private lands, be responsible for resolving the issues of the property rights required to develop the Project and assisting the negotiations with the land owners of the amount of all compensations or other fees or charges to be paid by the JV Company for such property rights;

d) approving the plan for construction of high voltage electric power transmission lines, proposed by the JV Company;

e) approving and assisting the JV Company to make telecommunication services available at the Sites, including the installation of necessary facilities and interconnection with a telecommunication in the P.R.C. to ensure the successful construction and operation of the Project;

f) procuring consent and permission of the owners of private land along with the steel tower and the Transmission Lines shall have to construct;

g) assisting the JV Company in negotiations with private owners of land and other easements along the Transmission Lines for determining compensation or other fees or charges to be paid to them and determining the amount of compensations or other fees or charges in cases the JV Company and the land owners cannot reach at agreement to fix the amount of compensations;

h) assisting to JV Company to import or re-export tax and duty free of such construction materials, equipment, machineries and spare parts as are required for the Project Construction and Management in accordance with the Foreign Investment Law of the Republic of the Union of Myanmar;

i) assisting the JV Company for the grant by the GOM of tax holiday with respect to this Project for 5 (five) years for income tax and for 3 (three) years for commercial tax commencing from the Commercial Operation Date of the Project;

j) assisting the JV Company to obtain exemption and relief from taxes, duties or levies of any kind other than the income tax calculated according to Clause 15.1.a).ii) and commercial tax according to Clause 15.1.a).i);

k) procuring the issuance of a legal opinion by the Director General of the Union Attorney General's Office substantially in the form set forth

in Annex(4) confirming that the issuance of the Concession Rights as set out in Annex (3) by the GOM and the authorities of the GOM set forth therein and exercised thereby are respectively valid and enforceable under the laws of the Republic of the Union of Myanmar;

l) assisting the JV Company to obtain for its foreign workers (and their dependents, where necessary) all necessary visas or other travel authorizations for entering into and remaining and traveling in Myanmar during the course of and to the extent necessary or appropriate of their work or intended work on the Project;

m) assisting the JV Company to obtain, from the Myanmar Governmental Authority the security personnel required to ensure the security of the Project during the Project Term and to help expedite work programs and to help in all aspects of field work undertaken by the JV Company in the Republic of the Union of Myanmar. DHPP shall, through such security personnel, consult with the JV Company as to the JV Company's requirements to ensure the security of the parts of the Project, including all JV Company personnel, any other personnel and the Project Facilities. The JV Company shall be to employ unarmed security guards to the extent necessary or appropriate for purpose of ensuring the security of the Project including all personnel and Project Facilities;

n) ensuring to obtain approvals from the GOM to allow (i) the equipment, goods and materials (including explosives and oil)

required for the Project to enter into Myanmar through Panwa and Kanpiteti check-points in Kachin State, and for the vehicles carrying the equipment, goods and materials to drive directly to the Sites; (ii) personnel for the Project to enter and exit from the aforementioned Check-points, (iii) construction materials, heavy and oversized equipment and materials to be discharged at Yangon Port and transported by land to the Sites;

o) processing the licensing for the establishment of offices in Nay Pyi Taw, Chipwi Nge and Myitkyina for the JV Company, and the licensing for the construction and use of land in relation to the said offices;

p) ensuring that the JV Company has the all rights of Project Management, including the rights of the Project Assets, Project Site and Project resources;

q) ensuring that the JV Company has the full rights to conduct businesses independently including the rights to sign PPAs.

17.8 AWC shall be responsible for the following:

a) assisting the JV Company to handle and obtain all permits and approvals required by the Laws and Regulations of the Republic of the Union of Myanmar necessary for developing the Project and establishing the JV Company;

b) assisting the JV Company to communicate and coordinate with relevant Myanmar government authorities and parties to ensure the implementation of the Project;

c) assisting the JV Company to arrange the financing of the Project;

d) assisting the JV Company to negotiate and sign the PPAs with Myanmar power purchasers of MOEP if the JV Company sells the electric power produced by it to Myanmar purchasers of MOEP in accordance with this Agreement; and

e) assisting the JV Company to complete the resettlement of the people to be resettled in accordance with the schedule of the Project.

18. FOSSILS AND ARTIFACTS

All fossils, coins, articles of value or antiquity and structures and other remains or items generally recognized as being of geological or archaeological interest found on the Site shall be property of the Government of the Republic of the Union of Myanmar and shall be liberty to excavate the said properties placed under the care and authority of the GOM. The JV Company shall take responsibility for reasonable precautions to prevent from removing or damaging same.

19. DIVIDENDS

19.1 The Shareholders shall agree to endeavor to make the Project and the JV Company viable and profitable. The Shareholders shall have same rights to participate in the profits of the JV Company in accordance with the respective shareholding in the JV Company. Such profits shall be by way of dividends. Decisions on making distributions shall be made by the Special Board Resolution.

19.2 The JV Company shall be required to maintain financial reserves in accordance with generally accepted accounting standards and the requirements of the lenders providing Debt Financing to the JV Company for the development and construction of the Project and which provide for expected maintenance and similar costs. The Parties agree that no other reserves will be required or maintained.

20. FORCE MAJEURE

20.1 If either Party is temporarily rendered unable, wholly or in part, by Force Majeure to perform its obligations under this Agreement, the Party whose performance is affected thereby shall give notice to other Party within 14(fourteen) days or as soon as is reasonably practicable after the occurrence of such Force Majeure giving full particulars in writing as to the cause and anticipated duration of such Force Majeure. The obligations of the performance of which have been affected by such Force Majeure shall be suspended and excused for the duration of such Force Majeure, but for no longer period, and such Force Majeure shall as far as is reasonably possible removed or mitigated by the Party affected thereby with reasonable dispatch. Neither Party shall be responsible for delay, damage or loss caused by Force Majeure.

20.2 If any Force Majeure adversely affecting the performance by a Party of its obligations pursuant to this Agreement continues for more than 12 (twelve) consecutive months, the Party whose performance has been

affected thereby may decide, after consultation and negotiation, with the other Party, whether to continue the performance of this Agreement, with whatever amendment hereto are required by to enable the successful implementation of Project Management notwithstanding the delay and other effects attributable to such Force Majeure or, as a last resort, to terminate this Agreement.

21. SETTLEMENT OF DISPUTES

21.1 If any dispute arises out of this Agreement or the Concession Rights or any other agreement or document executed in connection with this Agreement or the Concession Rights (in which case the "Parties" including the Ministry on behalf of the GOM and the JV Company), the Parties hereto shall consult with each other in good faith in order to settle such dispute amicably.

21.2 If these times of occasions of consultation fail to settle such dispute, the Agreement on Encouragement, Promotion and Protection of Investment between the Government of the P.R.C. and the GOM shall apply. In case the issue remains to be settled, it shall be finally settled by arbitration, through three arbitrators, in accordance with the provisions hereunder. Each Party shall appoint one arbitrator and the two arbitrators so appointed shall select a third arbitrator who shall serve as the chairman of the arbitration tribunal. The decision of the arbitrators shall be final and binding upon both Parties.

21.3 Each of the Parties agrees the Arbitration institution shall be Singapore International Arbitration Center and the UNCITRAL Rules shall be obeyed as the applicable arbitration rule. The venue of arbitration shall be Singapore and arbitration proceedings shall be conducted in English.

The appointed arbitrators should be chosen from the arbitrators' name list provided by Singapore International Arbitration Center.

22. CONFIDENTIALITY

22.1 Each of the Parties agrees to treat as secret and confidential the substance of this Agreement and all Confidential Information other than any Confidential Information which is required to be disclosed by a Party pursuant to any judicial to administrative process or pursuant to applicable law.

22.2 Neither Party hereto shall divulge to any person (other than those whose province it is to know it or with proper authority) or use for any purpose any of the information that it may acquire as a result of entering into this Agreement.

22.3 Each of the Parties shall endeavor to prevent its employee from doing anything which if done by a Party hereto would be a breach of Clauses 22.1 and 22.2. The restriction herein shall continue to apply after the expiration or termination of this Agreement without limit in point of time but shall cease to apply to information which comes into the public domain through no fault of a Party hereto.

23. NOTICES

23.1 Any notice, demand, request, report or other communication to be given by any Party to a Party pursuant to this Agreement (a "Notice") shall be in writing, in the English language, and shall be delivered personally or by prepaid letter(airmail if available), telex or facsimile transmission to the relevant address, telex number or fax number specified in Clause 23.2, and shall be deemed to have been received (a) if delivered personally; at the time of delivery to the addressee thereof, (b) if posted, 15 (fifteen) days after it has been put in the post, and (c) if transmitted by telex, at

the time dispatched provided the proper answerback appears at the beginning and end of the transmission, and (d) if transmitted by fax, at the time received by the addressees thereof,

23.2 Notices shall

(a) if given to DHPP, be addressed to

Department of Hydropower Planning

Ministry of Electric Power

Building No. 27, Nay Pyi Taw

The Republic of the Union of Myanmar

Attention: U Thaung Han

Fax: 95-67-410510

E-mail:dg-dhpp@moep1.gov.mm

Tel: 95-67-410407

(b) if given to CPIYN, be addressed to

1302 Dianchi Road, Kunming, P.R.China: 650228

Attention: Mr. Li Guanghua

Fax:+86 871 65660000

E-mail: liguanghua@cpiyn.com.cn

Tel: :+86 871 65660001

(c) if given to AWC, be addressed to

No. 61/62 Bahosi Development, Wardan Street, Yangon

The Republic of the Union of Myanmar

Attention: U Htun Myint Naing

Fax : +951 228012

E-mail : umk@myanmar.com.mm

Tel : +951 222422, +951 228013

23.3 If any of the Parties changes its name, address or telex or facsimile number for the purposes of this Clause 23, it shall notify the other Party of the details of such change, provided that such notification shall only be effective in respect of each of the other Parties as from the date on which the Notice is deemed received by such other Party in accordance with Clause 23.1.

24. WAIVER

The rights of each Party shall not be prejudiced or restricted by any indulgence or forbearance extended to the other Party and no waiver by either of them in respect of any breach by the other Party shall operate as a waiver in respect of any subsequent breach.

25. RENEGOTIATION AND MODIFICATION

a) In the event that any situation or condition arises due to circumstances not envisaged in this Agreement which adversely affects Project Management and thereby warrants amendment to this Agreement or the Concession Rights in order to enable Project Management to be implemented successfully, or such amendments are required in order to obtain limited recourse Debt Financing for the development and construction of the Project, the Parties shall make the necessary amendments to this Agreement or cause such amendments to be made to the Concession Rights to make the JV Company into an economic situation as such situations or conditions had never happened.

b) This Agreement shall not be amended, varied or modified, unless such amendment, variation or modification is expressly agreed in writing by each Party and subject to the approval of Myanmar Investment Commission.

c) After signing this agreement, all parties shall negotiate to reach agreements to be stipulated in the loan Agreement.

26. NON-ASSIGNMENT

Save in accordance with the express provisions hereof, neither this Agreement nor any of the rights or obligations hereunder may be assigned by a Party in whole or in part except with the prior written consent of the other Party.

27. ENTIRE AGREEMENT

27.1 Whenever mentioning this Agreement, it shall mean not only this Joint Venture Agreement, but also all Annexes attached hereto and all amendments from time to time (if any) to this Joint Venture Agreement and to all Annexes attached hereto. This Agreement, together with other agreements which have been executed before the signing of this Agreement between CPIYN and DHPP and/or AWC in connection with the JV Company and the subject matter of this Agreement, sets forth the entire agreement and understanding of the Parties in connection with the JV Company and the subject matter of this Agreement. And the Terms and Conditions in other agreements shall continue to be effective provided that for those Terms and Conditions with respect to this Project, which are not in conformity with this Agreement, this Agreement shall prevail.

27.2 The Parties hereby agree that, in the event of any difference or conflict between the Articles of Association or the Memorandum of Association and this Agreement, this Agreement shall prevail, and, in such event, the Articles of Association or the Memorandum of Association shall be interpreted and/or deemed to have been amended to conform to this

Agreement, and the Parties shall cause the JV Company to amend the Articles of Association or the Memorandum of Association to be in conformity with the terms of this Agreement.

28. **SEVERABILITY**

If any provision of this Agreement shall be deemed illegal or unenforceable, such illegality or unenforceability shall not affect the validity and enforceability of any other legal and enforceable provisions hereof, which shall be construed as if such illegal or unenforceable provision or provisions had not been inserted herein, unless the severance of such illegal or unenforceable provisions would or shall destroy the underlying business purposes of this Agreement.

29. **ORIGINALS AND DUPLICATES OF THE AGREEMENT**

This Agreement shall be made in English language in 6 (six) originals and 12 (twelve) duplicates, each of DHPP, CPIYN and AWC holds 2 (two) originals and 4 (four) duplicates. All duplicates shall be equally valid with the originals after this Agreement coming into force.

30. **GOVERNING LAW**

This Agreement shall be governed by and construed and interpreted in all respects in accordance with the Laws and Regulations of the Republic of the Union of Myanmar.

31. **WAIVER OF THE SOVEREIGN IMMUNITY**

To the extent that DHPP may in any jurisdiction claim for itself or its assets immunity from suit, execution, attachment (whether in aid of execution, before judgment or otherwise) or other legal process and to the extent that in any such jurisdiction there may be attributed to itself or its assets, such immunity (whether or not claimed), DHPP hereby irrevocably and

unconditionally agrees not to claim and waives such immunity to the full extent permitted by the Laws and Regulations.

32. TERMINATION

32.1 This Agreement may be terminated upon 90 (ninety) days prior written notice by CPIYN and AWC in the case of Sub-clauses 32.1 (a) and (b), and by either Party in the case of the remainder of the following Sub-clauses:

a) failure to satisfy the requirements of Clause 5.1 hereof within 180 (one hundred and eighty) days of the formation of the JV Company and the signing of this Agreement ;

b) the Terms and Conditions of the Concession Rights not being honored;

c) the winding-up of the JV Company;

d) expiration of the Concession Rights; and

e) date of expiry of this Agreement.

32.2 Upon material breach of this Agreement by either Party and failure by the breaching Party to rectify such breach within 60 (sixty) days of receiving written notification of such breach from the non-breaching Party, or such other period of time as is reasonably required for the breaching Party to rectify such breach to the extent it is not reasonably practicable to rectify such breach within 60 (sixty) days of receiving such written notification of breach by the non-breaching Party, the non-breaching Party may terminate this Agreement upon 90 (ninety) days written notification; provided further that if the breaching Party cures such material breach before the expiration of such 90 (ninety) days notification

period, such cure shall eliminate such breach and this Agreement shall not be terminated notwithstanding such written notification of termination by the non-breaching Party. For purposes of this Clause 32.2, material breach means the failure of a Party hereto to perform satisfactorily an obligation under this Agreement which materially and adversely affects or otherwise frustrates one of the objectives of this Agreement or which materially increases the difficulties associated with or otherwise would frustrate the timely and successful development of the Project and/or Project Management.

32.3 This Agreement may also be terminated before the expiry of the term of the JV Company by mutual written consent of the Parties.

32.4 No Party shall terminate this Agreement unilaterally by reason of Force Majeure unless the Concession Rights are terminated by reason of its expiration.

33. CONDITIONS PRECEDENT

This Agreement shall become effective and the Parties shall be bound by their respective obligations herein on the date on which the following 5 (five) conditions have been fully satisfied:

a) this Agreement has been properly signed, sealed and delivered by duly authorized representatives of DHPP, CPIYN and AWC.

b) this Investments into the Project of CPIYN shall have been approved by all relevant Governmental Authorities of the P.R.C;

c) this Agreement shall have been approved by all relevant Governmental Authorities of the Republic of the Union of Myanmar;

d) the Concession Rights shall have been approved and issued by the GOM in substantially the form set forth in Annex (3) to this Agreement; and

e) the Union Attorney General's Office shall have issued a Legal Opinion substantially in the form of Annex (4) hereto confirming that (i) this Agreement is effective, valid and enforceable under the laws of the Republic of the Union of Myanmar, and (ii) the Concession Rights as set out in Annex (3), once issued by the GOM or the Ministry duly authorized by the GOM, and the authorities of the Ministry set forth therein and exercised thereby will be respectively valid and enforceable under the Laws of the Republic of the Union of Myanmar.

IN WITNESS WHEREOF, the Parties hereto have caused this Agreement to be duly executed by the authorized representatives of the Parties in Nay Pyi Taw, Republic of the Union of Myanmar, on the day first above written.

For and on behalf of	For and on behalf of	For and on behalf of
THE DEPARTMENT OF HYDROPOWER PLANNING MINISTRY OF ELECTRIC POWER THE REPUBLIC OF THE UNION OF MYANMAR	CPI YUNNAN INTERNATIONAL POWER INVESTMNT CO., LTD. THE PEOPLE'S REPUBLIC OF CHINA	ASIA WORLD CO., LTD. THE REPUBLIC OF THE UNION OF MYANMAR
Signed by: U Thaung Han	Signed by: Mr. Li Guanghua	Signed by: U Htun Myint Naing
Designation: Director General	Designation: President	Designation: Managing Director

WITNESSES

For and on behalf of	For and on behalf of	For and on behalf of
THE DEPARTMENT OF HYDROPOWER PLANNING MINISTRY OF ELECTRIC POWER THE REPUBLIC OF THE UNION OF MYANMAR	CPI YUNNAN INTERNATIONAL POWER INVESTMNT CO., LTD. THE PEOPLE'S REPUBLIC OF CHINA	ASIA WORLD CO., LTD. THE REPUBLIC OF THE UNION OF MYANMAR
Signed by: U Aye San	Signed by: Mr. Cao Junhua	Signed by: U Zaw Win
Designation: Deputy Director General	Designation: Vice President	Designation: Project Director

List of Annexes

Annex (1): Memorandum of Association

Annex (2): Articles of Association

Annex (3): Concession Rights

Annex (4): Legal Opinion

ANNEX (1)

UNDER THE MYANMAR COMPANIES ACT

AND

THE SPECIAL COMPANY ACT, 1950

PRIVATE JOINT VENTURE COMPANY LIMITED BY SHARES

MEMORANDUM OF ASSOCIATION

OF

Chipwi Nge Hydropower Co., Ltd.

---

1. The name of the Joint Venture Company is "Chipwi Nge Hydropower Co., Ltd."(hereinafter referred to as the "Company").

2. The registered office of the Company will be situated in Nay Pyi Taw, the Republic of the Union of Myanmar.

3. The Joint Venture Company is to be formed under the Special Company Act 1950 and the Companies Act 1914 as a "Special Company" in which CPI Yunnan International Power Investment Co., Ltd. (hereinafter referred to as "CPIYN") will have a share capital of eighty percent (80 %), the Department of Hydropower Planning, under the Ministry of Electric Power, the Republic of the Union of Myanmar (hereinafter referred to as "DHPP") will have a share capital of fifteen percent (15 %), and Asia World Company (hereinafter referred to as "AWC") will have a share capital of five percent (5 %). The Company formed under the

Special Company Act 1950 shall not be deemed a "Foreign Company" under the Myanmar Companies Act.

4. All the provisions of the Special Company Act 1950 shall apply to this Company and also all other provisions of the Myanmar Companies Act not specifically or implication or intention repealed or excluded by the Memorandum of Association and Articles of Association of the Company shall apply.

5. The Company shall be registered as a private company of limited liability under the Special Company Act 1950 and the Myanmar Companies Act. The Company shall also apply and obtain a "Permit" under the Republic of the Union of Myanmar Foreign Investment Law.

6. The objects which the Company is established are those set out in the sub-clauses (i) to (xx), both inclusive of these sub-clauses:

   (i) To utilize or receive the land at the Site necessary for the project; to possess the permanent and Ancillary Facilities; to utilize the water body, divert the water in the River and manage and utilize the water surface for the purposes of the Project Management (the terms herein have the meanings ascribed in the JV Agreement);

   (ii) To survey, produce, buy, sell, develop, procure, enter into an agreement, convert, plan, build, examine, analysis, design, install, obtain, transmit, maintain, develop, collect, reserve, bid, hire for construction, repair, import, export and engage in any other operations relating to the operation and maintenance of hydropower station, electrical energy and other related works supporting such business;

(iii) To buy, treat, import, or otherwise obtain fuels and/or fuel residual used for the business operation as referred to in (ii);

(iv) To train staff with respect to the management and maintenance of hydropower plants, power generating and distributing systems, power generating units, transmission lines and equipment used in such power plants;

(v) To construct warehouse, laboratory and any other kinds of buildings and structures relating to the operation of business of referred to in (i)-(iv), and to store, sell, retail and export materials and products manufactured by the Company, including import buy, manufacture, rent, lease, or acquire by other means the machinery, equipment, building raw materials and necessary to the business operation;

(vi) To import, use, rent, hire-purchase or acquire by any means the machinery, equipment, buildings and structures, spare part and other raw materials used for the business of the Company;

(vii) To carry on all or any of the business which may seem capable to the Company to be conveniently carried out in connection with any of the above business objectives;

(viii) To import, export, purchase, sell, lease and rent of any goods, supplies, raw materials, packaging materials, machinery, equipment, spare parts, and articles necessary for the business of the Company;

(ix) To establish branch businesses or agencies at the Project site, in Myitkyina and in Nay Pyi Taw and regulate, carry on or discontinue the same;

(x) To make, accept, endorse, execute, negotiate and deal with promissory

notes, bills of exchange and other negotiable instruments;

(xi) To enter into agreements for sharing profits, union of interests, co-operation, joint venture, reciprocal concession or otherwise with any other company, firm or person carrying on or possessed of property suitable for the purposes of this Company;

(xii) To lease, exchange or hire any real or personal property and rights or privileges which may be necessary or convenient for the purposes of the Company's business;

(xiii) To build, construct, erect, install, maintain, alter, upgrade, enlarge, demolish, remove or replace any buildings, works, structures, factories, plants, mills, machinery and equipment at any time when it is necessary or convenient for the business of the Company, or to join with any person, firm or company in doing any of the things aforesaid;

(xiv) To borrow or raise money on such terms and conditions as the Company shall think fit, and if thought fit, to secure the payment of such moneys or any other money at any time owing by the Company by executing or issuing mortgages, charges or liens upon any of the Company` s assets and all or any of the uncalled capital for the time being of the Company to the lenders and to receive money on deposit at interest;

(xv) To publicize and promote the products of the Company by any means and media as may seem expedient including, in particular, advertisement, press, circulars, display and exhibition of works of art or interest, publications, books, booklets, periodicals, prizes, rewards and donations or any other means the Company shall think fit;

(xvi) To invest and deal with the moneys of the Company not immediately required for the purpose of its business in such manner as may from time to time be considered expedient and to dispose of or vary any such investments of securities;

(xvii) To enter in to any arrangement with any government or other authorities, supreme, municipal, local or otherwise, and to obtain from any such government or authorities all rights, concessions and privileges which may seem conductive to Company` s objects or any of them, and to obtain any legislative enactment for the purpose of carrying out, extending or varying the objects and powers of the Company, and to oppose any proceedings or applications which may seem calculated directly or indirectly to prejudice the Company`s interest;

(xviii) To distribute among the members in specie any property of the Company pursuant to the relevant rules and regulations;

(xix) To carry on any other trade or business or to do any other act or things whatsoever which can in the opinion of the Board of Directors be advantageously carried on by the Company as principals, agents, contractors, trustees or otherwise and either alone or in conjunction with other;

(xx) To do all such other things as may be deemed incidental or conductive to the attainment of the above business objectives and the business objectives set forth in Clause 8.2 of the Joint Venture Agreement executed by DHPP, CPIYN and AWC on the [ ]day of ----------, 2015.

It is hereby declared that:

(1) where the context so admits, the word "company" in this clause shall be deemed to include any statutory, municipal or public body or any body corporate or incorporated association, including a partnership or other body of persons whether or not incorporated and, if incorporated, whether or not a company within the meaning of the Myanmar Companies Act and whether registered in the Republic of the Union of Myanmar or elsewhere; and

(2) the objects specified in each of the paragraphs of this clause shall be regarded as independent objects and accordingly shall in no way be limited or restricted (except where otherwise expressed in such paragraph) by reference to or inference for the terms of any other paragraph, but may be carried out in as full and ample a manner and construed in as wide a sense as if each of the said paragraphs defined the objects of a separate and distinct company. In the event of any ambiguity or conflict, this clause shall be construed and understood in such a way as to widen and not to restrict the legal capacity or power of the Company.

7. The liability of the Shareholders is limited to the amount which has not been paid in or which such Shareholders are obligated to pay in, in respect of the Shares held by them.

8. Capital

(1) The share capital of the Company shall be denominated in Dollars. The final Authorized Share Capital of the Company shall be US$ 1,000,000 (One Million Dollars only) which shall be divided into 10,000 (ten

thousand Shares only). The par value of each share shall be US$ 100.00 (one hundred Dollars).

(2) The authorized Shares shall be subscribed by CPIYN and AWC, ninety four point twelve percent (94.12 %) of which shall be subscribed by CPIYN and five point eighty eight percent (5.88 %) by AWC. fifteen percent (15 %) of the authorized Shares shall be allotted to DHPP as the royalty payment according to Clause 6.1 (a) of the Joint Venture Agreement. The subscription amount and percentage of Shares allocated to each party respectively are as follows:

Shareholder	Proportion of Subscription	No. of Shares	Subscription Amount (USD)	Percentage of Shareholding
CPIYN	94.12 %	8,000	941,200	80 %
DHPP	0	1,500	0	15 %
AWC	5.88 %	500	58,800	5 %
Total	100 %	10,000	1,000,000	100 %

(3) The initial issued and paid-up share capital of the JV Company shall be US$ 100,000 (One hundred thousand Dollars), divided into 1000 (one thousand Shares). CPIYN and AWC's initial paid-up Shares shall be subscribed within ninety (90) days after the JV Agreement comes into effect, and this period may be extended with the prior mutual consent of the Parties if necessary. DHPP's initial paid-up Shares shall be subscribed according to

Clause 6.1 (a) and 6.2 of this Joint Venture Agreement;

(4) The initial issued Shares shall be subscribed by CPIYN and AWC and shall be allotted to each party respectively as follows:

Share holder	Proportion of Subscription	No. of Shares	Subscription Amount (USD)	Percentage of Shareholding
CPIYN	94.12 %	800	94,120	80 %
DHPP	0	150	0	15 %
AWC	5.88 %	50	5,880	5 %
Total	100 %	1,000	100,000	100 %

9. The JV Company shall have rights to increase or reduce the share capital from time to time when the Shareholders decide in accordance with the Articles of Association of the Company. Upon any increase of the share capital, new Shares may be issued with any preferential, deferred or qualified with special rights, privileges or conditions, provided that the rights attached to the Shares having preferential, deferred or qualified with special rights privileges or conditions attached thereto may be altered or dealt with in accordance with the Articles of Association of the Company; otherwise, such Shares may not be issued.

We, the following persons whose names, nationalities, addresses and descriptions are subscribed below are desirous to form a private joint-venture company pursuant to this Memorandum of Association, and we respectively agree to take the number of Shares in the capital of the Company set opposite our respective names.

Sr. No.:	Name, Address & Occupation of Subscribers	Nationality & N.R.C. No.	Number of Shares Taken & Percentage of Shareholding	Signatures
1	CPI Yunnan International Power Investment Co., Ltd. Represented by: Mr. Li Guanghua President 1302, Dianchi Road, Kunming, Yunnan, P.R.China	Chinese	Ordinary 8,000 80 %	
2	Department of Hydropower Planning Represented by: U Thaung Han Director General No.27 Nay Pyi Taw The Republic of the Union of Myanmar	Myanmar	Ordinary 1,500 15 %	
3	Asia World Company Limited Represented by: U Tun Myint Naing Managing Director The Republic of the Union of Myanmar	Myanmar	Ordinary 500 5 %	

Nay Pyi Taw Dated : the ---------day of -------------------, 2015

It is hereby certified that the persons mentioned above put their signatures in my presence.

ANNEX(2)

UNDER THE MYANMAR
COMPANIES ACT
AND
THE SPECIAL COMPANY ACT, 1950
PRIVATE JOINT VENTURE COMPANY LIMITED
BY SHARES

ARTICLES OF ASSOCIATION

OF

CHIPWI NGE HYDROPOWER CO., LTD.

TABLE OF CONTENTS

1. INTERPRETATIONS ..... - 3 -
2. PRIVATE JOINT VENTURE COMPANY ..... - 4 -
3. SHARE CAPITAL AND SHARES ..... - 5 -
4. TRANSFER AND TRANSMISSION OF SHARES ..... - 6 -
5. SHARE CERTIFICATE ..... - 8 -
6. LIEN AND FORFEITURE ..... - 9 -
7. CALL ON SHARE ..... - 12 -
8. ALTERATION OF CAPITAL ..... - 12 -
9. MODIFICATION OF CLASS RIGHTS ..... - 14 -
10. GENERAL MEETING ..... - 15 -
11. NOTICE OF GENERAL MEETINGS ..... - 15 -
12. PROCEEDINGS AT GENERAL MEETING ..... - 16 -
13. VOTES OF SHAREHOLDERS ..... - 17 -
14. CORPORATIONS ACTING BY REPRESENTATIVES ..... - 19 -
15. BOARD OF DIRECTORS ..... - 19 -
16. POWER AND DUTIES OF THE DIRECTORS ..... - 22 -
17. PROCEEDINGS OF DIRECTORS ..... - 24 -
18. SEAL ..... - 26 -
19. DIVIDENDS AND RESERVE ..... - 26 -
20. ACCOUNTS ..... - 28 -
21. WINDING UP ..... - 29 -

INTERPRETATIONS

1. In these Articles, unless otherwise defined herein, the words and expressions defined in the Special Company Act, 1950, and the Myanmar Company Act, or any statutory modification or amendment thereof for the time being in force (hereinafter collectively referred to as "Act"), shall have the same meaning when used herein and words importing the singular shall include the plural and vice versa, and words importing the masculine gender shall include the feminine and neuter genders and vice versa, and words importing persons shall include bodies corporate.

WORDS	**MEANINGS**
Auditors	means such firm of independent accountants of recognized international standing as may be appointed as the JV Company's auditors in accordance with the provisions of this Joint Venture Agreement;
"Board" or "Board of Directors"	means the board of directors from time to time of the JV Company.
"Company"	as used in these Articles of Association means Chipwi Nge Hydropower Co., Ltd., a privately-owned limited liability company established pursuant to the Joint Venture Agreement and in accordance with the Myanmar Companies Act 1914 and the Special Company Act 1950.
"Director" or "Directors"	shall mean the directors of the Company for the time being as duly appointed in accordance with the Joint Venture Agreement and these Articles of Association.
"Joint Venture Agreement"	means the agreement dated the ---- of --------- 2015 between the Department of Hydropower Planning, under the Ministry of Electric Power of the Republic of the Union of Myanmar ("DHPP") and CPI Yunnan International Power Investment Co., Ltd. ("CPIYN") and Asia World Company Limited (AWC).
"Ordinary Share"	means any Share other than a Preference Share, All Shares issued by the Company are Ordinary Share.
"Share"	means any Ordinary Share and/or any Preference Share.
"Shareholder"	means any Person who is a holder of a record of any Shares which were acquired in accordance with these Articles of Association on the Joint Venture Agreement, dated the ---- of --------- 2015.

PRIVATE JOINT VENTURE COMPANY

2. The Company is a Private Company as defined in Sub-section (13) of Section 2 of the Myanmar Companies Act and accordingly the following provisions shall be in effect:

   (1) the number of Shareholders for the time being of the Company, exclusive of persons who are in the employment of the Company, shall be limited to fifty (50); provided that if two or more persons hold one or more Shares in the Company jointly, they shall for the purpose of this Article be treated as a single Shareholder;

   (2) any invitation to the public to subscribe for any Share or debenture or debenture stock of the Company is hereby prohibited;

   (3) the right to transfer the Shares of the Company shall be restricted in the manner hereinafter prescribed in these Articles.

3. The regulations contained in Table A in the first Schedule of the Myanmar Companies Act shall not apply to the Company except in so far as they are expressly incorporated or deemed to be incorporated herein. Compulsory regulations stipulated in Section 17 Sub-section (2) of the Myanmar Companies Act shall always apply to the Company. These Articles shall be effective so far as they have no prejudice to the provisions of the Special Company Act 1950 and other existing laws.

   These Articles are adopted pursuant to the Joint Venture Agreement. The Joint Venture Agreement shall be binding on the Company and its Shareholders as if the terms thereof are set out in these Articles. If there shall be any inconsistency

between the Articles and the Joint Venture Agreement, the terms of the Joint Venture Agreement shall prevail.

4. The registered office of the Company shall be at such place in Myanmar as the Board of Directors shall from time to time determine.

SHARE CAPITAL AND SHARES

5. The shares of the Company shall be divided into 10,000 (Ten Thousand) Shares, the par value of each of which shall be US$100.00(One Hundred US Dollars).

6. All Shares shall be regarded as owned by the Shareholders whose name is recorded in the Company's Share Register. No bearer Shares shall be issued by the Company. If a Share is held by two (2) or more persons in common, they must appoint one (1) of them to exercise their rights as Shareholders. Subject to the Act, no shares may be issued by the Board of Directors without the prior approval of the Company in a general meeting of the Shareholders.

7. (1) Unless otherwise agreed in a general meeting of the Shareholders, all unused shares shall before issue be offered for subscription to CPIYN and AWC in proportion as nearly as the circumstances will permit to the number of Shares then held by them.

(2) Any such offer as aforesaid shall be made by notice in writing, specifying the number of Shares and the price at which the same are offered and limiting the time (not being less than twenty-eight (28) days, unless the Shareholder to whom the offer is to be made otherwise agrees), within which the offer, if not accepted in writing, will be deemed to be declined.

(3) Subject to Article 7(1), Article 21 and to any special right attached to any Shares for the time issued in the Company, any new Shares may be issued upon such terms and conditions and with such preferred, deferred, or other special rights or such restrictions, whether in regard to dividend, voting, return of Share capital, or otherwise, as the Company from time to time in a general meeting of the Shareholders by special resolution determine.

8. The amount payable on application for Shares shall be at least five percent (5 %) of the par value of the shares, and the Directors shall, as regards any allotment of Shares, duly comply with such of the provisions of Sections 101 and 104 of the Myanmar Companies Act as may be applicable thereto.

9. Except to the extent allowed by Section 54 A of the Myanmar Companies Act, no part of the funds of the Company shall be employed in the purchase of, or in loans upon the security of, the Company's shares.

TRANSFER AND TRANSMISSION OF SHARES

10. No Shareholder shall transfer, sell or otherwise deal in any way with all or any part of his Shares except in accordance with the provisions of these Articles.

11. (1) Shares, may be sold, transferred or pledged only following prior approval of the Board of Directors, which shall not be withheld in the case of the transfer made in accordance with Article 11 and the Joint Venture Agreement.

(2) No Shareholder shall transfer, pledge or otherwise dispose of or encumber its Shares in the Company otherwise than as set forth in Article 11 or as otherwise agreed by the Shareholders. However, in the event Shareholder pledges its Shares in the Company for the Loan or Debt Financing described under Joint Venture Agreement, consent of other Shareholder shall not be unreasonably withheld.

(3) Any Shareholder wishing to transfer any of its Shares in the share capital of the Company (the "Offering Shareholder") shall give a notice in writing (the "Transfer Notice") to the other Shareholder (the "Offered Shareholder"), who shall have a right to purchase these Shares at a price and on the terms specified in the Transfer Notice. Such offer must identify Shares being sold and must invite the Offered Shareholder to apply, within 30 (thirty) days from the date of receipt of the Transfer Notice, to purchase such Shares.

(4) If the Offered Shareholder does not exercise the right to purchase those Shares within the period as specified in Article 11(3), then the Offering Shareholder shall be entitled to sell the Shares included in the Transfer Notice to a third party within sixty (60) days from the date of the Transfer Notice on terms and conditions no more favorable than those initially specified in the Transfer Notice, provided that, in the event of a sale by DHPP, the third party shall not be a commercial competitor of CPIYN.

(5) In the event any Shareholder at anytime sells, assigns, or transfers any of its shares to a person not a party to the Joint Venture Agreement such Shareholder shall cause the purchaser acquiring such shares to furnish an undertaking both to the transferor and to the remaining Shareholders and the JV Company, under which the purchaser, assignee or transferee agrees to observe and be bound by all provisions of the Joint Venture Agreement and these Articles of Association.

(6) Notwithstanding the provisions of Article 11(3), CPIYN's Shares may be transferred to anyone of its affiliates with the negotiation of the Parties.

12. A registered Shareholder shall be the only person recognized by the Company as having any title to the Share(s).

13. Any person becoming entitled to any Share in consequence of the death or bankruptcy of any Shareholder shall, upon surrender of the Share certificate when possible, and on proper evidence being produced, be registered as Shareholder, or may transfer such Share to any other person by executing to such person an instrument of transfer, subject always to the provisions as to transfer contained in Article 11.

14. The instrument of transfer of any Share shall be signed by both the transferor and the transferee whose signatures shall each be certified by at least one (1) witness. The transferor shall be deemed to remain the holder of such Share until the transfer has been approved by the Board of Directors pursuant to Article 11 (1) and the name and address of the transferee is entered in the Share Register in respect of such Share.

SHARE CERTIFICATE

15. If Share any certificate is mutilated or obliterated, the Board of Directors shall, upon surrender thereof, order the cancellation of Share certificate and shall issue a new Share certificate, in case of loss or destruction of a Share certificate, if proper evidence is produced, the Board of Directors shall issue a new Share certificate; the Board may first require the provision of a fee as it deems appropriate.

16. Apart from the provisions of these Articles, the Board of Directors may, by resolution, impose any regulations in connection with the handling of Shares, as it may deem fit, provided that such regulations shall not be inconsistent with these Articles.

LIEN AND FORFEITURE

17. The Company shall have a first and paramount lien and right to charge on every Share (not being in a fully paid share) for all moneys (whether presently payable or payable, at a fixed time in respect of that Share), and the Company shall also have a lien on all Shares (including fully paid Shares) standing registered in the name of Shareholder for all moneys and debts presently payable by him or his estate to the Company; but the Directors may at any time declare any Share to be wholly or in part exempt from the provisions of this Article. The company's lien, if any, on a share shall extend to all dividends payable thereon.

18. For the purpose of enforcing such lien the Company may sell, in such manner as the Directors think fit, any Share on which the Company has a lien, but no sale shall be made unless some sum in respect of - which the lien exists is presently payable, nor until the expiration of fourteen (14) days after a notice in writing stating and demanding payment of such part of the amount in respect of which the lien exists as is presently payable, has been given to the registered holder for the time being of the Share, or the person entitled.

19. The net proceeds of any such sale shall after payment of the costs of such sale or attempted sale be applied in payment of such part of the amount in respect of which the lien exists as is presently payable, and any residue shall (subject to a like lien for sums not presently payable, as existed upon the Shares prior to the sale) be paid to the person entitled to the Shares at the date immediately before the sale.

20. (1) If any Shareholder fails to pay the whole or any part of any call or installment of a call on the day appointed for payment thereof, the Directors

may, at any time thereafter during such time as any part of the call or installments remains unpaid, serve a notice on him requiring payment of so much of the call or installment as is unpaid, together with any interest and expenses which may be accrued by reason of such non-payment.

(2) The notice shall name a further day (not earlier than the expiration of 14 (fourteen) days from the date of service of the notice) on or before which the payment required by me notice is to be made. It shall also name the place where the payment is to be made and shall state that, in the event of non-payment at or before time appointed, the Shares in respect of which the call was made will be liable to be forfeited.

21. If the requirements of any such notice as aforesaid are not complied with, any Share in respect of which the notice has been given may at any time thereafter, before, the payment required by the notice has been made, be forfeited by a resolution of the general meeting of Shareholders to that effect.

22. A forfeiture of shares shall include all dividends in respect of the shares not actually paid before the forfeiture notwithstanding that such dividends shall have been previously declared. The Directors may accept a surrender of any share liable to be forfeited hereunder.

23. (1) A Share so forfeited or surrendered shall become the property of the Company and may be sold, re-allotted or otherwise disposed of either to the person who was before such forfeiture or surrender the holder thereof or entitled thereto, or to any other person, on such terms and in such manner as the Directors think fit and at any time before a sale, re-allotment or disposition the forfeiture may be cancelled on such terms as the Directors think fit.

(2) The Company may receive the consideration, if any, given for the Share on any sale or disposition thereof and may execute a transfer of the share in favor of the person to whom the share is sold or disposed and be bound to see to the application of the purchase money, if any, nor shall his title to the Share be affected by any irregularity or invalidity in the proceedings in the reference to the forfeiture, sale or disposal of the Share and after his name has been entered in the Register of Shareholders, the validity of the sale shall not be impeached by any person.

24. In the event of a forfeiture of Shares or a sale of Shares to satisfy the Company's lien thereon, the Shareholder or other person who, prior to such forfeiture or sale was entitled thereto, shall be bound to deliver and shall forthwith deliver to the Company the certificate or certificates held by him for the Shares so forfeited or sold.

25. A person whose Shares have been forfeited shall cease to be a Shareholder in respect of the forfeited Shares, but shall, notwithstanding such forfeiture, remain liable to pay to the Company all moneys which at the date of such forfeiture were payable by him to the Company in respect of Shares with interest thereon at 5% (five percent) per annum (or such other rate as the Directors may approve) from the date of forfeiture or surrender until payment, but his liability shall cease if and when the Company shall have received payment in full of all such money in respect of the Shares and the Directors may waive payment of such interest either wholly or in part.

26. Notice of any forfeiture shall be given to the holder of the Share forfeited or the person entitled by transmission to the Share forfeited as the case may be. An entry of the forfeiture with the date thereof shall be made in the Register of

Shareholders opposite to the Share. The provisions of this Article are directory only, and no forfeiture shall be in any manner invalidated by any omission to give such notice or to make such entry as aforesaid.

27. A duly verified declaration in writing that the declarant is the Managing Director of the Company, and that a share in the company has been duly forfeited on the date stated in the declaration, shall be conclusive evidence of the facts therein stated as against all persons claiming to be entitled to the Share.

28. The provisions of these regulation as to forfeiture shall apply in the case of non-payment of any sum which, by the terms of issue of a Share, becomes payable at a fixed time, whether on account of the amount of the Share or by way of premium, as if the same had been payable by virtue of a call duly made and notified.

CALL ON SHARE

29. The Board of Directors may from time to time make call upon the Shareholders in respect of any moneys unpaid on their shares or on any class of their shares, and each Shareholder shall [(subject to receiving at least 14 (fourteen) days' written notice specifying the time or times of payments]) pay to the Company at the time or times so specified the amount called on his Shares.

ALTERATION OF CAPITAL

30. Directors may, with the approval of the Company at general meeting of the Shareholders, whether all the shares for the time being authorized shall have been issued or all the shares for the time being issued shall have been fully called up or not, by an ordinary resolution increase the share capital by the creation and issue of new shares, such aggregate increase to be of such amount

and to be divided into shares of such respective amounts, as the resolution shall prescribe.

31. Subject to Article 19 above and any special rights for the time being attached to any existing class of Shares, the new Shares shall be issued upon such terms and conditions and with such rights and privileges annexed thereto as the general meeting of the Shareholders resolving upon the creation thereof shall direct.

32. Subject to any direction to the contrary that may be given by the resolution of the Shareholders sanctioning the increase in Share capital, all new Shares shall, before issue, be offered to such persons as at the date of the offer are entitled to receive notices of from the Company of general meetings in proportion, as nearly as the circumstances admit, to the amount of the existing Shares offered, and limiting a time (not being less than twenty-eight (28) days, unless the Shareholder to whom the offer is made otherwise agrees) within which the offer, if not accepted, will be deemed to be declined, and subject to the other provisions of these Articles, after the expiration of that time, or on the receipt of written confirmation from the person to whom the offer is made that he declines to accept the Shares offered, the Directors may dispose of the same in such manner as they think most beneficial to the Company.. The Directors may likewise so dispose of any new Shares which (by reason of the ratio which the new shares bear to shares held by persons entitled to an offer of new shares) cannot, in the opinion of the Directors be conveniently offered under this Article.

33. The new Shares shall be subject to the same provisions with reference to the payment of calls, lien, transfer, transmission, forfeiture and otherwise as the Shares in the original Share capital.

34. The Company may, by ordinary resolutions:

(1) consolidate and divide its Share capital into Shares of larger amount than its existing Shares;

(2) by sub-division of its existing Shares or any of them, divide the whole or any part of its Share capital into Shares of smaller amount than is fixed by the Memorandum of Association, subject nevertheless, to the provisions of paragraph (d) of Sub-section (1) of Section 50 of the Myanmar Companies Act;

(3) cancel any Shares which, at the date of the passing of the resolution, have not been taken or agreed to be taken by any person.

35. The Company may, by ordinary resolution, reduce its Share capital and any capital redemption reserve fund in any manner, and with any subject to any incident authorized and consent required by law.

MODIFICATION OF CLASS RIGHTS

36. All Subject to the provisions of the Act, all or any of the special rights or privileges attached to any class of Shares in the capital of the Company for the time being may, at any time, before as well as during liquidation, be modified, varied, altered or abrogated, either with the consent in writing of the holders of all the issued shares of the class, or with the sanction of all the holders of shares of that class passed at a separate general meeting of Shareholders the holders of shares of that class, and all the provisions contained in this Articles relating to the general meetings shall mutatis mutandis apply to every such meeting, but so that the quorum thereof shall be not less than 2 (two) persons personally present and holding or representing by proxy one quarter of the issued shares of the

class, and that any holder of shares of the class, present in person or by proxy, shall on a poll be entitled to one vote for each share of the class held by him, and if at any adjourned meeting of such holders such quorum as aforesaid is not present, any two holders of shares of the class who are personally present shall be a quorum. The Board of Directors shall comply with the provisions of the Myanmar Companies Act as to forwarding a copy of any such consent or resolution to the Register of Companies.

GENERAL MEETING

37. General meetings of the Shareholders of the Company shall be held at such place as the Board of Directors may decide and indicate in the notice for the meeting. English shall be the language used in the general meeting, including but not limited to, the notice, documents, voting, minutes and resolutions for the meeting, and it shall be the obligations of the Board of Directors to keep the minutes of meeting, results of voting, and the written documentation of the final resolutions.

NOTICE OF GENERAL MEETINGS

38. (1) Subject to the provisions of the Act, a general meeting of Shareholders shall be held within 6 (six) months of the date of registration of the Company and a general meeting shall be held at least once in every subsequent 12 (twelve) month period, Such general meetings are called "Annual General Meetings", and all other general meetings are called "Extraordinary General Meetings". Subject to the foregoing, the Directors may summon general meetings by an affirmative vote of a simple majority of Directors whenever they think fit but not at unreasonable intervals.

(2) Written notice of any general meeting of the Shareholders, signed by any director or by any person authorized by the Board of Directors, shall be sent to each Shareholder, at his last known address as shown in the Share Register of the Company, at least 14 (fourteen) clear days before the scheduled date of the Meeting. Notice to Shareholders in Myanmar shall be given by registered post and notice to Shareholders abroad shall be sent by a registered airmail (return receipt requested) or by facsimile with confirmed answer back. The notice shall specify the place, the day and the hour of the meeting, and the nature of the business to be transacted thereat. Any notice sent by mail in a letter properly addressed and posted is deemed to have been served at the time when such letter would have been delivered in the ordinary course of registered post. Notice sent to the Shareholders outside Myanmar shall be confirmed on the day of dispatch by fax.

39. (1) Any notice of a meeting to consider special business shall specify the general nature of the business and shall be accompanied by a statement regarding the effect of any proposed resolution in respect of such special business.

(2) The notice convening a meeting to consider a Special Resolution shall specify the intention to propose the resolution as a Special Resolution.

PROCEEDINGS AT GENERAL MEETING

40. A quorum of a general meeting of Shareholders shall require the presence of Shareholders and or their proxies representing not less than the majority of all Shares issued.

41. If within 30 (thirty) minutes from the time appointed for the meeting a quorum is not present, the meeting shall be dissolved; in which case, it shall stand adjourned to the same day in the next week at the same time and place and if at the adjourned meeting a quorum is not present within 30 (thirty) minutes from the time appointed for the meeting, the Shareholders present shall be a quorum.

42. The Chairman for the time being of the Board of Directors shall preside as Chairman at every general meeting of the Company.

43. If there is no such chairman, or if at any meeting he is not present within 15 (fifteen) minutes after the time appointed for holding the meeting, or is unwilling to act as Chairman, the Shareholders present shall choose one of their number to be Chairman.

44. Unless otherwise provided by the Joint Venture Agreement, the Act or in these Articles, all resolutions of the Shareholders shall be carried by simple majority of votes cast.

VOTES OF SHAREHOLDERS

45. At any general meeting a resolution put to the vote of the meeting shall be decided by a vote by ballot. Each Shareholder entitled to vote may vote in person or by proxy. Each Shareholder present in person or by proxy shall have 1 (one) vote for each share he holds.

46. In the case of joint registered holders of any share any one of such persons may vote and be reckoned in a quorum at any meeting either personally or by proxy as if they were solely entitled thereto and if more than one of such joint holders be so present at any meeting that one of such person so present whose name stands first in the Register of Shareholders in respect of such share shall alone

be entitled to vote in respect thereof. Several executors or administrators of a Shareholder in whose name any share stands shall for the purpose of this Article be deemed joint holders thereof.

47. A Shareholder of unsound mind, or in respect of whom an order has been made by any court having jurisdiction, may vote whether on a show of hands or on a poll by his committee or other legal guardian, and any such committee or guardian may, on a poll, vote by proxy.

48. The instrument appointing a proxy shall be in writing under the hand of the appointer or of his attorney duly authorized in writing or if the appointer is a corporation, either under the common seal, or under the hand of an officer or attorney so authorized. A proxy need not be Shareholder of the Company.

49. The instrument appointing a proxy, and the power of attorney or other authority (if any) under which it is signed, or a notarized and certified copy of that power or authority, shall be deposited at the registered office of the Company not less than 48 (forty eight) hours' before the time for holding the meeting and in default the instrument of proxy shall not be treated as valid.

50. An instrument appointing a proxy may be in any form which the Directors shall approve.

51. No objection shall be raised as to the qualification of any voter or to the validity of any vote except at the meeting or adjourned meeting at which the vote objected to is given or tendered and every vote not disallowed at such meeting shall be valid for all purposes. Any such objection made in due time shall be referred to the Chairman of the meeting whose decision shall be final and conclusive.

CORPORATIONS ACTING BY REPRESENTATIVES

52. Any corporation which is a Shareholder of the Company may by resolution of its Directors or other governing body authorize such person as it deems appropriate to act as its representative at any meeting of the Company or of any class of Shareholders of the Company. The person so authorized shall be entitled to exercise the same powers on behalf of such corporation as the corporation could exercise if it were an individual Shareholder of the Company and such corporation shall for the purposes of these presents be deemed to be present in person at any such meeting if a person so authorized is present thereat.

BOARD OF DIRECTORS

53. The Company shall be managed by the Board of Directors and the Managing Director.

54. The Board of Directors shall consist of nine (9) Directors, six (6) of whom, including the Managing Director, shall be appointed upon the nomination of CPIYN, and one (1) shall be appointed upon the nomination of AWC, and two (2) shall be appointed upon the nomination of DHPP. The term of office for each Director shall be three (3) years. The Chairman of Board of Directors shall be elected from the Directors nominated by CPIYN by majority of the Directors. The Managing Director shall be appointed by the Board of Directors upon the nomination of CPIYN, by a simple majority of the Directors. The Deputy General Manager and Chief Finance Officer shall be appointed by the Board of Directors upon nomination by the Managing Director.

55. The appointment of Directors shall be decided by a general meeting of Shareholders. Any vacancy in the Board shall be filled with a person nominated

by the Shareholder having the original right of nomination in accordance with these Articles.

56. The Company may from time to time, by a special resolution of the general meeting of the Shareholders, increase or reduce the number of Directors, but the minimum number of Directors shall not be less than two.

57. A Director may be removed at any time by the Shareholder who nominated him notwithstanding any provision of these Articles or of any agreement between the Company and such Director, but without prejudice to any claim such Director may have for damages for breach of any such agreement.

58. The Board of Directors shall keep registers as required by Section 87 and such other provisions of the Myanmar Companies Act, in particular the records in regard to the registration of the particulars of mortgages and charges affecting the property of the Company or created by it, and to keeping a register of the Directors and to sending to the Registrar (as defined in the Companies Act) an annual list of Shareholders, and a summary of particulars relating thereto and notice of any consolidation or increase of Share capital and copies of special resolutions and a copy of the register of Directors and notification of any changes therein.

59. (1) The remuneration of Directors shall, from time to time, be determined by the Company in general meeting of Shareholders.

(2) Each Director shall, in addition to any other remuneration, be entitled to recoup all reasonable traveling, hotel and other expenses properly incurred by him for the purpose of attending meetings of the Board of Directors or of any committee or any general meeting of Shareholders or otherwise in the course of the Company's business.

60. The office of a Director shall be dismissed:

(1) if he receives a order made against him or makes any arrangement or compromise with his creditors.

(2) if he becomes a person of unsound mind;

(3) if, without special leave of absence from the Board of Directors, he absents himself from three (3) consecutive meetings of the Directors or from all meetings of the Directors for a continuous period of three (3) months and they pass a resolution to vacate his office by reason of such absence;

(4) if, by notice in writing to the Company, he resigns his office;

(5) if he is prohibited from being a Director by virtue of any applicable law;

(6) if he is removed from office pursuant to a resolution passed under the provision of these Articles or pursuant to Article 57 herein.

61. Upon the removal, resignation, death or retirement of a Director, or vacation of office by any Director for any reason, his or her successor shall be appointed by written instrument by the same Shareholder that nominated the former Director. As to the appointment of a Director to fill any vacancy occurring in the Board of Directors otherwise than by rotation, the Director so appointed shall retain his office during such time only as the former Director was entitled to retain the same.

62. A Director is not required to own any Share or to hold any office in the Company.

POWER AND DUTIES OF THE DIRECTORS

63. (1) The following matters shall be determined by the Board of Directors and require the approval or consent of the Board of Directors and in the event that any of the matters shall not be resolved by the Board of Directors, the same shall be determined by the Shareholders in the general meeting:

(a) to appoint the Managing Director and accept his resignation;

(b) to review the performance and the accounts of the Company;

(c) to decide on dividend policy, borrowing and disposal of assets as proposed by the Managing Director;

(d) to approve contracts and investments with a monetary value in excess of USD 200,000 (two hundred thousand US dollars);

(e) to approve any mortgage, pledge, charge, or encumbrance in respect of any part of the assets or legal property or contractual rights of the Company, or the decision to enter into any agreement to do so;

(f) to decide on investment proposals submitted by the Managing Director; and

(g) to commence or institute any litigation, arbitration, or other legal proceedings in any official or quasi-official forum, or commence or negotiate any compromise or settlement with respect of any claim by or against the Company.

(2) The Board shall manage the business of the Company in accordance with the law and the Company's Memorandum of Association and Articles of Association and shall have the authority to do all things therein provided or related thereto.

(3) The Managing Director shall have the authority to do the following acts and things for and on behalf of the Company:

(a) to manage on a daily basis, supervise and direct the business of the Company and, in this connection, to enter into transactions directly with any person or persons, natural or juristic, with respect to any matter in connection with the business of the Company;

(b) to engage, appoint, dismiss, remove or suspend, including in the course of disciplinary actions taken against employees who violate the rules and regulations of the Company, officers, clerks, agents, employees and servants which are permanent or temporary, as the Managing Director may deem appropriate, and to determine their titles, powers and duties and fix their remuneration;

(c) to stipulate, working rules and regulations and establish salary policy, sign correspondence in the name of the Company, and execute all bonds, deeds, bills of lading, invoices, delivery orders and other instruments in respect of any goods, wares or merchandise, including all usual and customary mercantile transfers, contracts, agreements and undertakings in direct connect with the business of the Company;

(d) to do any and all other acts and things necessary for the proper and efficient conducting of the Company's business, or which may be incidental or ancillary thereto;

(e) to set down the marketing policy and fix the prices, product by product, customer by customer, and to take any decision justified by an emergency situation; and

PROCEEDINGS OF DIRECTORS

64. A meeting of the Board of Directors shall be called by the Chairman upon not less than 14 (fourteen) days written notice to any Director. The Board of Directors may hold their meetings at such places as they deem appropriate, but in any case not less frequently than twice per year. The Chairman shall add to the agenda for any such meeting any matters proposed for deliberation by any Director.

65. The Chairman shall preside at all meetings of the Board of Directors, but if at any meeting the Chairman is not present within 10 (ten) minutes after the time appointed for holding the meeting, the Directors present shall elect any other Director to preside as Chairman at the said meeting.

66. (1) Notice of every Directors' meeting shall be sent to each Director. Notice to Directors in Myanmar shall be given by registered post or by hand and notice to Directors abroad shall be sent by a registered airmail (return receipt required) or by facsimile with confirmed answer back'. Notice to Directors residing outside Myanmar shall be confirmed on the day of dispatch by facsimile. Such notice to any director may be waived by the Director and shall be deemed waived by his presence at the meeting without protest of lack of proper notice.

(2) The quorum of the meeting of the Board of Directors shall be at least 6 (six) Directors, either present in person or by proxy, and with each Shareholder being required to be represented by at least 1 (one) Director who has been nominated by it.. If within thirty (30) minutes from the time appointed for the meeting a quorum is not present, the meeting shall be dissolved; in which

case, it shall stand adjourned to the same day in the next week at the same time and place, and if at the adjourned meeting a quorum is not present within thirty (30) minutes from the time appointed for the meeting, the Directors present shall be a quorum.

(3) Unless otherwise provided by the Joint Venture Agreement, the Act, or in this Articles, all resolutions of the Board of Directors shall require the affirmative vote of a majority of all Directors present in person or by proxy at a meeting.

(4) The Board of Directors may adopt a resolution without holding a meeting if all Directors approve the action by placing their signatures on the original copy of the resolution. Any such resolution shall be binding on the Company only after all of the Directors have signed the resolution, The duly signed resolution shall be delivered to the Chairman and placed in the Minutes Book of the Company,

67. A Director shall be entitled to appoint in writing any person to act as his proxy. The person so appointed shall, in the absence of the Director appointing him, be entitled to attend and vote at any meeting of the Board of Directors. The instrument appointing the proxy shall specify the meeting or meetings or the period for which the appointment is effective. In the event the person so appointed is himself a Director or if the proxy holder not being a Director receives more than one appointment, he shall be entitled to cast as many votes as appointments he holds, in addition to his personal vote if he is a Director.

68. A Director who is in any way, whether directly or indirectly interested in a contract or proposed contract with the Company shall declare the nature of his interest in accordance with the provisions of the Act.

69. All acts bona fide done by any meeting of the Directors or of a committee of Directors, or by any person acting as a Director, shall, notwithstanding that it be afterwards discovered that there was some defect in the appointment of any such Director or person acting as aforesaid, or that they or any of them were disqualified, be as valid as if every such person had been duly appointed and was qualified to be a Director.

70. Minutes of meetings of the Board of Directors shall be kept in the English language.

71. The Directors shall cause proper minutes to be made in books to be provided for the purpose of all appointment of offices made by the Directors, of the proceedings of all meetings of Directors and Committees of Directors, and of the attendances thereat and of the committees of Directors and all business transacted, resolutions passed and orders made at such meetings and any such minutes of any meeting, if purporting to be signed by the Chairman of such meeting or by the Chairman of the next succeeding meeting of the Company or Directors or Committee as the case may be, shall be sufficient evidence without any further proof of the facts therein stated.

SEAL

72. The Board of Directors shall provide for the establishment of a Seal of the Company, and the Seal shall never be used except by the authority of the Directors as set forth in this Articles, the Memorandum of Association and the law of Myanmar.

DIVIDENDS AND RESERVE

73. No dividend may be declared unless pursuant to a unanimous decision of the Board of Directors or by a resolution adopted in a general meeting of the Shareholders.

74. The Board of Directors may from time to time recommend payment of dividends to the Shareholders as appear to the Board of Directors to be justified by the profits of the Company.

75. The Board of Directors may, before recommending any dividend, set aside out of the profits of the Company such sums as they think proper as a reserve or reserves which shall at the discretion of the Board of Directors, be applicable for meeting contingencies, or any other purpose to which the profits of the Company may be properly applied, and pending such application may, at the like discretion, either be employed in the business of the Company or be invested in such investments (other than Shares of the Company) as the Directors may from time to time think fit.

76. If several persons are registered as joint holders of any Share, any one of them may give effectual receipts for any dividends payable on the Share.

77. Declaration of dividend shall be given by written notice to each Shareholder registered as such in the register of Shareholders.

78. No dividend shall bear interest against the Company.

79. The Directors may deduct from any dividend or other moneys payable in respect of any Share held by a Shareholder, either alone or jointly with any other Shareholder, all such sums of money (if any) as may be due and payable by him either alone or jointly with any other person to the Company on account of calls or otherwise.

80. A transfer of a Share shall not pass the right to any dividend declared in respect thereof before the transfer has been registered.

ACCOUNTS

81. The Board of Directors shall cause to be kept at the registered office of the Company, proper accounts of the assets and liabilities of the Company and all other accounts which by law or business practice should be kept by the Company, and such accounts (which shall be kept with English language) shall be audited, .periodically by a qualified Auditor appointed by the Shareholders.

82. The Board of Directors shall cause the books and records of the Company to be audited annually in accordance with the law of the Republic of the Union of Myanmar and Internationally Generally Accepted Accounting Principles.

83. The Auditor(s) of the Company shall be appointed by the Board of Directors in accordance with Section 145A of the Myanmar Companies Act (or any successor legislation thereto) and the duties and responsibilities of the Auditor(s) shall be as specified under the law of the Republic of the Union of Myanmar.

84. The Directors shall from time to time determine whether and to what extent and at what times and places and under what conditions or regulations the accounts and books of the Company or any of them shall be open to the inspection of Shareholders not being Directors, and no Shareholder (not being a Director) shall have any right of inspecting any account or book or document of the Company except as conferred by law or authorized by the Directors or by a resolution of the Company in general meeting.

85. The Directors shall, as required by Sections 131 and 131 A of the Act, cause to be prepared and to be laid before the Company in general meeting such profit and loss accounts, balance sheets and reports as are referred to in those sections.

86. The profit and loss accounts shall, in addition to the matters referred to in

Sub-section (3) of Sections 132 of the Companies Act, show, arranged under the most convenient heads, the amount of gross income, distinguishing the several sources from which it has been derived, and the amount of gross expenditure, distinguishing the expenses of the establishment, salaries and other like matters. Every item of expenditure fairly chargeable against the year's income shall be brought into account, so that a just balance of profit and loss may be laid before the meeting, and in cases where any item of expenditure, which may in fairness be distributed over several years has been incurred in any one year, the whole amount of such items shall be stated with the addition of the reasons why only a portion of such expenditure is charged against the income of the year.

87. A balance sheet shall be made out in every year and laid before the Company in general meeting of the Shareholders made up to a date not more than 6 (six) months before such meeting. The balance sheet shall be accompanied by a report of the Directors as to the state of the Company's affairs, and the amount which they recommend to be paid by way of a dividend (if any) and the amount (if any) which they propose to carry to a reserve fund.

88. A copy of the balance sheet and report shall, seven (7) days before the meeting, be sent to the persons entitled to receive notices of general meetings in the manner in which notices are to be given herein.

89. The Directors shall in all respects comply with the provisions of Section 130 to 133 and 135 of the Myanmar Companies Act or any statutory modification thereof for the time being in force.

WINDING UP

90. If the Company shall be wound up, the assets of the Company shall be applied

in repayment of any holders of shares, including the shares paid up at the commencement of the winding up.

We, the following persons, whose names, nationalities, addresses and descriptions are subscribed below, are desirous to formed a Company in pursuance of these Articles of Association, and we respectively agree to take the number of Shares in the capital of the Company set opposite our respective names.

Sr. No.	Name, Address & Signature Description of Subscribers	Nationality & N. R. C. No.	Number of Shares taken	Signatures
1	DEPARTMENT OF HYDROPOWER PLANNING Represented by:U Thaung Han, Director General No. 27 Nay Pyi Taw The Republic of the Union of Myanmar	Myanmar	Ordinary 1,500 [15 %]	

Sr. No.	Name, Address & Signature Description of Subscribers	Nationality & N. R. C. No.	Number of Shares taken	Signatures
2	CPI YUNNAN INTERNATIONAL POWER INVESTMENT CO., LTD. Represented by: Mr. Li Guanghua President 1302 Dianchi Road, Kunming, Yunnan The People's Republic of China	Chinese	Ordinary 8,000 [80 %]	
3	ASIA WORLD COMPANY LIMITED Represented by: U Tun Myint Naing Managing Director The Republic of the Union of Myanmar	Myanmar	Ordinary 500 [5 %]	

Nay Pyi Taw **Dated : the ------- day of ------------,2015**

It is hereby certified that the persons mentioned above put their signatures in my presence.

ANNEX (3)

CONCESSION RIGHTS

THESE CONCESSION RIGHTS (hereinafter referred to as the "**Concession Rights**") are issued and granted by the Government of the Republic of the Union of Myanmar (hereinafter referred to as the "**GOM**") to Chipwi Nge Hydropower Co., Ltd. (hereinafter referred to as the "**JV Company**"), a company incorporated under the laws of Myanmar with its registered office at ________________ in the Republic of the Union of Myanmar, as of ---------, -----------, 2015, for the Project Term.

WHEREAS:

A. The Republic of the Union of Myanmar is the sole owner of all natural resources within her territory and has the right to develop, exploit and utilize the natural resources in the interest of the people of the Republic of the Union of Myanmar;

B. The Contract No. (68)/ DHPI/ 2007-2008 (hereinafter referred to as "the Contract") for construction power project (Chipwi Nge) which was intended to be developed non-commercial nature for supplying and distributing the electricity for the development of hydropower projects in Maykha, Malikha and upstream of Ayeyawady-Myitsone River Basins (hereinafter referred to as "the Projects"), had been signed between Department of Hydropower Implementation, Ministry of Electric Power No. (1) (hereinafter referred to as "DHPI")and China Power Investment Corporation (hereinafter referred to as "CPI") on 27th February 2008.

C. The Parties agree that the Contract Shall be automatically dissolved on the date on which the Joint Venture Agreement has become effective.

D. The Ministry of Electric Power No. (1) and Ministry of Electric Power No. (2) had been merged into Ministry of Electric Power in 5th September 2012 so as to further promote in developing power sector in Myanmar.

E. The Memorandum of Agreement for the development, operation and transfer of the hydropower projects in Maykha, Malikha and Up-stream of Ayeyawady-Myitsone river basins (hereinafter referred to as "MOA") signed between MOEP and CPI on 16th June 2009.

F. The Parties have the right to follow the provision stipulated in the Supplementary Agreement to MOA (hereinafter referred to as "Supplementary Agreement") signed between Department of Hydropower Planning (hereinafter referred to as "DHPP") and CPIYN on (……) (…….) 2015.

G. DHPP, a government department under MOEP, is responsible for planning of exploration, development and production of hydroelectric power within the Republic of the Union of Myanmar, and has the right for coordination with Department and Enterprise under MOEP to carry out and operate all hydroelectric power projects, and has been authorized by the Government of the Republic of the Union of Myanmar to execute this Agreement and to develop the Project.

H. The National Energy Administration of the People's Republic of China and MOEP, on behalf of their respective governments, had signed the Framework Agreement on Joint Development of Hydropower Resources in Myanmar on 26th March 2009 (hereinafter referred to as the "Framework Agreement") in

Nay Pyi Taw, setting up the policy framework for supporting the cooperation and development of the Project.

I. CPIYN, a state-owned clean energy enterprise registered in P.R.C, has outstanding experience and achievements in the development, construction and operation in the area of hydropower project, CPIYN (including its predecessor) has successfully implemented the Project.

J. AWC, an enterprise incorporated in the Republic of the Union of Myanmar, which has some experience and capabilities in implementation of hydropower projects in Myanmar, is willing to jointly cooperate in the development of Chipwi Nge Hydropower Station in accordance with this JV Agreement.

K. DHPP, CPIYN and AWC, pursuant to the Supplementary Agreement to the MOA desire to incorporate a private limited liability company in accordance with the Myanmar Companies Act, 1914 and the Special Company Act, 1950 for the purpose of jointly developing the projects upon the terms and conditions set forth therein.

NOW THEREFORE, in furtherance of the development, financing, construction, operation and maintenance of the Project as contemplated by the JV Agreement, the GOM hereby grants and issue to the JV Company the following exclusive rights, Permits, covenants, warranties, privileges and protections:

1. **Interpretation**

For purposes of there Concession Rights, unless otherwise expressly defined herein, defined terms (those terms the first letters of which are capitalized herein) shall have the same meaning as set forth in the JV Agreement.

2. **Grant of Rights and Privileges**

2.1 The GOM hereby grants to the JV Company (including its shareholders if necessary) in accordance with the Supplementary Agreement the exclusive right to develop, operate and transfer of Chipwi Nge Hydropower Station on Chipwi river in the Republic of the Union of Myanmar, the Concession Period of which is 40 (forty) years starting from the Commercial Operation Date of hydropower generating unit thereof, including granting for use in connection with the Project (i) the exclusive right and license to undertake and engage in the Project Management for the Project Term and (ii) exclusive easements or rights of way or other appropriate rights with respect to the Sites for the Project Term, which rights, licenses, easements and other rights including:

(a) The rights to possess, use and procure benefits from the Project, including the right to sell the electricity generated by the Project for sale to purchasers of MOEP;

(b) The right to dam and use the water of the Chipwi river at the Station Site;

(c) The right to construct, maintain and operate all Project Facilities and Project Assets;

(d) Subject to the Laws and Regulations, the right to clear away, remove, take and/or use those from the Sites, including the Ancillary Facilities, such as timber (for construction purposes), soil, stone, sand, gravel, lime, water and other products and materials (other than minerals as defined in the Mines Law) as are necessary for, or are to be used in Project Management; Provided that timber used shall be paid for at fair and reasonable prices to be agreed between the Parties, and timber not used shall be made available for a reasonable period for removal by persons authorized or nominated by the relevant Myanmar Governmental Authority;

(e) The right for the JV Company and its Contractors to procure the performance of such work or services in connection with or in furtherance of Project Management as the JV Company or such Contractors may deem necessary or appropriate;

(f) The right, to be exercisable by the JV Company or any Contractors, to employ (and to define the term and conditions therefore) such Persons (whether foreign workers or nationals of the Republic of the Union of Myanmar) in connection with or in furtherance of Project Management as the JV Company and/or such Contractors may deem necessary or appropriate, provided that any employment of such Persons for service within the Republic of the Union of Myanmar, including the terms and conditions of such employment, shall be subject to laws and regulations;

(g) The right to install and operate for the JV Company and, to the extent the JV Company deems appropriate, for the use of Contractors its and their employees and agents, such telecommunication facilities as it considers necessary or appropriate to assist Project Management in accordance with laws and regulations;

(h) The right to such easements, rights of way or other rights for Access Routes to and from all Sites, including those of Ancillary Facilities, as the JV Company may find necessary or appropriate to permit or facilitate the exercise of any of the other rights granted hereunder;

(i) In accordance with Foreign investment Law and the procedures there under, the right to procure, import into the Republic of the Union of Myanmar and export from the Republic of the Union of Myanmar such Materials, Vehicle and Equipment as the JV Company or such Contractors may deem necessary or appropriate in connection with or in furtherance

of Project Management and on such terms and conditions and through the suppliers of same as the JV Company or such Contractors may deem necessary or appropriate;

(j) The right and authority throughout the Project Term to receive, disburse, hold, effect payments, distributions and dividends and to otherwise transact business with Foreign Currency both within and outside the Republic of the Union of Myanmar. In respect of other matters of foreign currency arising in any way out of or in connection with the development, financing, operation and maintenance of the Project or the JV Agreement, the JV Company shall (i) be entitled to pay outside of the Republic of the Union of Myanmar its foreign and/or foreign controlled Contractors, sub-contractors and foreign employees in foreign currencies and such Contractors, sub-contractors and foreign employees shall be entitled to receive and retain such foreign currencies abroad; and (ii) be entitled to receive treatment no less favorable than that accorded to any other foreign company carrying on any business or operations in the Republic of the Union of Myanmar; provided further, that the foregoing rights and authorities shall apply to the foreign employees, foreign contractors and foreign-controlled contractors, sub-contractors and foreign employees of Contractors;

(k) The right to enjoy the exemptions and the maximum relief from Taxes as permitted pursuant to Section -------- of the Republic of the Union of Myanmar Foreign Investment Law, Law No. -----------, including:

(i) The Commercial Tax shall be exempted 3 (three) years (36 months) consecutively starting from the date of the Commercial Operation Date of the Project. After that, Commercial Tax shall be payable at

the rate of 5 % (five percent) on export proceeds or services and local sale in foreign currency;

ii) The Income Tax shall be exempted 5 (five) years (60 months) consecutively starting from the Commercial Operation Date of the Project at the rate of 25 % (twenty five percent). And the Income Tax payable by the JV Company after exemption period shall be paid in foreign currency by calculating according to the Ministry of Finance's Order No. (--------).

(l) The right to grant valid, effective and enforceable security interests in the Project Assets, and to assign and/or transfer by way of security its rights and/or obligations under the JV Agreement and its rights hereunder to Lenders in order and as required to obtain limited recourse Debt Financing for the Project;

(m) The right to implement the design, testing, quality control, operations, management, inspection, repair and maintenance and related works of the Project in accordance with standards and criterions as approved by MOEP and may support such activities with other international standards and specifications whenever and wherever necessary;

(n) The right to transport (i) the equipment, vehicles, goods and various materials relating to the Project to enter into the Republic of the Union of Myanmar through Panwa and Kanpiteti check-points in Kachin State; (ii)personnel for the Project to enter and exit from the aforementioned check-points; (iii) the vehicles carrying the equipment, goods and various materials to drive directly to the Sites approved by GOM and;

(q) (i) The right to obtain all authorizations, permissions, approvals, consents, decrees and licenses required or otherwise appropriate for

the Project; the JV Company shall be responsible to bear compensations or other fees or charges as required by the relevant Laws for resettlement required for the development, construction, operation and maintenance of the Project. The Parties shall use best efforts to ensure the expense for resettlement shall not exceed 1 %(one percent) of the Static Investment of the Project.

(ii) Regarding the conducting for corporate social responsibility of the project, the parties agree that at least one percent (1 %) on annual net profit of power station will be set up as an official fund so as to continuously provide necessary assistance to the people who suffer the impacts caused by the project implementation works.

(r) The parties agree that Ministry of Electric Power (MOEP) shall have right to purchase the electricity from Chipwi Nge Hydropower Station in terms of Power Purchase Agreement so as to fulfill the state power demands.

(s) The parties agree if Upstream Ayeyawady Confluence Basin Hydropower Co., Ltd. (ACHC) needs to use the electricity from Chipwi Nge Hydropower Station to provide for the development of the Projects as construction power, ACHC could purchase directly from the JV Company after prior consent from MOEP is obtained. In order to increase the power production of Chipwi Nge HPP, help the local business grow and improve local economy, the JV Company shall be permitted to conduct direct power supply services to the other large users who consume a large volume of electricity, build transmission lines connecting with the large users, and collect payment for the electricity sold to them so as to shorten the trial operation period and reduce the losses of the JV Company.

2.2 As set forth in Clause 6.3 of the JV Agreement, the JV Company is hereby relieved of any and all obligations to pay any separate rent, royalty or other compensation (other than Taxes in accordance with Clause 15 of the JV Agreement) of the any kind to the GOM or any other Person with respect to the JV Agreement, Project Management, the rights, warranties, covenants and Permits and issued to the JV Company herein, the entire compensation for which shall be the royalty payments to the GOM pursuant to Clause 6.1 of the JV Agreement (except such payments as may from time to time be payable to DHPP as a Shareholder pursuant to the JV Agreement).

2.3 The JV Company is hereby relieved of any and all obligations regarding the management of the social and environmental impacts caused by the Project and Project Management other than as specifically set forth in Clause 13.3 of the JV Agreement.

3. **Warranties and Covenants**

3.1 The rights, Permits, covenants, warranties, privileges or protections granted and issued to the JV Company by the GOM pursuant to these Concession Rights have been granted and issued in accordance with, and are and will be valid and fully effective and enforceable under all Laws and Regulations as in effect on the date hereof. No action will be taken or permitted by any governmental agency, authority and instrumentality of the GOM that would eliminate, impair or reduce the effects of any such rights, Permits, covenants, warranties, privileges or protections or which would materially adversely affect Project Management, the Project, the JV Company or the Shareholders, provided that the JV Company shall abide by Laws and Regulations in performing its obligations under the JV Agreement.

3.2 With respect to the rights, Permits, covenants, warranties, privileges or protections afforded to the JV Company by the these Concession Rights, the JV Company shall be entitled to receive treatment no less favorable than that accorded to any other electricity production or construction company carrying on business or operations in the Republic of the Union of Myanmar, and the GOM shall revise these Concession Rights as required to ensure the foregoing covenant is satisfied.

3.3 In the event that the JV Company shall have to pay taxes other than those assessable on the JV Company, or taxes the rate or the amount of which is mire than that is payable by the JV Company, under Clause(15.1)(a) in the JV Agreement, the amount of tax so paid or over-paid by the JV Company shall be deducted from the dividend or any payment by the JV Company to DHPP.

4. Revision of Concession Rights

With respect to the GOM regarding these Concession Rights, Clause 25(a) of the JV Agreement is incorporated herein in its entirety.

5. Waiver and Immunity

Clauses 24 and 31 of the JV Agreement with respect to the GOM regarding these Concession Rights are incorporated herein in its entirety.

6. Term

These Concession Rights shall become immediately effective upon issuance and shall continue in effect until the earlier to occur of (i) termination or expiration of the JV Agreement, and (ii) the expiration of the Project Term

The forgoing rights, Permits, covenants, warranties, privileges or protections are hereby granted and issued by the GOM to the JV Company as of the date appearing at the beginning of these Concession Rights.

ON BEHALF OF : THE REPUBLIC OF THE UNION OF MYANMAR

BY: ______________________________

ANNEX (4)

LEGAL OPINION

THE REPUBLIC OF THE UNION OF MYANMAR
OFFICE OF THE UNION ATTORNEY GENERAL
Nay Pyi Taw

Letter No: [ ]
Date: [ ]

Legal Opinion

1. To: CHIPWI NGE HYDROPOWER CO., LTD.

2. This legal opinion is issued in respect of the following documents:
   a) The Joint Venture Agreement between the Department of Hydropower Planning, under the Ministry of Electric Power of the Republic of the Union of Myanmar ("DHPP") and CPI Yunnan International Power Investment Co., Ltd. ("CPIYN") and Asia World Company Limited (AWC). dated [ ] (the "JV Agreement"); and
   b) The Concession rights to be issued by the Ministry of Electric Power of the Republic of the Union of Myanmar substantially in the form set forth in Annex (3) of the JV Agreement (the "Concession Rights")

3. For the purpose of this Legal Opinion, I have reviewed and examined the following documents:
   a) the JV Agreement and the annexes thereto;
   b) Annex (3) the Concession Rights;
   c) [Insert any other relevant documentation]; and
   d) Such laws, ordinance, rules, regulations, procedures, directives, notifications and other legislation of the Republic of the Union of Myanmar as are relevant for the purpose of giving this legal opinion.

4. Based upon my consideration and review of each of the aforementioned documents and the meaning of them, and in the name of the Office of the Union

Attorney General of the Republic of the Union of Myanmar, I hereby express my opinion and confirm the following:

a) the JV Agreement has been properly signed, sealed and delivered by a duly authorized representatives of DHPP, CPIYN and AWC;

b) the JV Agreement has been approved by all relevant Governmental Authorities of the Republic of the Union of Myanmar.

c) Once the opinion letter is issued by the Director General of the Office of the Union Attorney General of the Republic of the Union of Myanmar, the JV Agreement will be effective, valid and enforceable under the laws of the Republic of the Union of Myanmar; and

d) Once approved by the Republic of the Union of Myanmar and issued by the Ministry of Electric Power in substantially the form set forth in Annex(3) to the JV Agreement, the Concession Rights and the authorities of the Ministry set forth therein and exercised thereby will be respectively effective and valid and the Concession Rights will be enforceable under the laws of the Republic of the Union of Myanmar.

5. This Legal Opinion is confirmed to and given on the basis of the laws of the Republic of the Union of Myanmar in force as at the date hereof. I have not investigated and do not express or imply any opinion on the laws of any other jurisdiction and I have assumed that no other such law would affect any opinion stated herein. This Legal Opinion is being issued for the benefit of the parties identified in paragraph I herein and this opinion is not to be relied upon by other person.

Yours faithfully,

For and on behalf of the Office of the Union Attorney General

(Signature) ____________________

(Name) ____________________

(Designation) ____________________

DEED OF ASSIGNMENT

AMONG

DEPARTMENT OF ELECTRIC POWER PLANNING

MINISTRY OF ELECTRIC POWER

THE REPUBLIC OF THE UNION OF MYANMAR,

CPI YUNNAN INTERNATIONAL POWER INVESTMENT COMPANY LIMITED

THE PEOPLE'S REPUBLIC OF CHINA,

ASIA WORLD COMPANY LIMITED

THE REPUBLIC OF THE UNION OF MYANMAR

AND

ROYAL VICTORY SERVICES COMPANY LIMITED

THE REPUBLIC OF THE UNION OF MYANMAR

FOR

THE DEVELOPMENT, OPERATION AND TRANSFER OF

CHIPWI NGE HYDROPOWER PROJECT

IN

THE REPUBLIC OF THE UNION OF MYANMAR

2015

DEED OF ASSIGNMENT

AMONG

DEPARTMENT OF ELECTRIC POWER PLANNING

MINISTRY OF ELECTRIC POWER

THE REPUBLIC OF THE UNION OF MYANMAR,

CPI YUNNAN INTERNATIONAL POWER INVESTMENT COMPANY LIMITED

THE PEOPLE'S REPUBLIC OF CHINA,

ASIA WORLD COMPANY LIMITED

THE REPUBLIC OF THE UNION OF MYANMAR

AND

ROYAL VICTORY SERVICES COMPANY LIMITED

THE REPUBLIC OF THE UNION OF MYANMAR

FOR

THE DEVELOPMENT, OPERATION AND TRANSFER OF

CHIPWI NGE HYDROPOWER PROJECT

IN

THE REPUBLIC OF THE UNION OF MYANMAR

2015

Deed of Assignment

For

The Development, Operation and Transfer of Chipwi Nge Hydropower Project

In The Republic of the Union of Myanmar

This **DEED OF ASSIGNMENT** is signed and delivered in Nay Pyi Taw, the Republic of the Union of Myanmar on (22nd) October, 2015, by and among:

(1) Department of Electric Power Planning (hereinafter referred to as "DEPP" which expression shall include its successors and permitted assigns), Ministry of Electric Power (hereinafter referred to as "MOEP") of the Republic of the Union of Myanmar, a legal body duly constituted under the laws of the Republic of the Union of Myanmar, represented by U Khin Maung Win, Director General of DEPP and its administrative address at office No.27, Nay Pyi Taw, the Republic of the Union of Myanmar for the purpose of signing the Deed of Assignment of one part; and

(2) CPI Yunnan International Power Investment Company Limited, a company organized and existing under the laws of the People's Republic of China (hereinafter referred to as "CPIYN" which expression shall include its successors, legal representative and permitted assigns) represented by Mr. Wang Qi, Vice President of CPIYN and its registered address at 1302 Dianchi Road, Kunming, Yunnan, P.R. China for the purpose of signing the Deed of Assignment of the forth part;

(3) Asia World Co., Ltd, a company organized and existing under the laws of the Republic of the Union of Myanmar (hereinafter referred to as "AWC" which expression shall include its successors, legal representatives and permitted assigns) represented by U Htun Myint Naing, Managing Director of AWC and its registered address at

No.61/62 Bahosi Development, Warden Street, Yangon, the Republic of the Union of Myanmar for the purpose of signing the Deed of Assignment of the second part;

(4) Royal Victory Services Co., Ltd, a company organized and existing under the laws of the Republic of the Union of Myanmar (hereinafter referred to as "RVS" which expression shall include its successors, legal representatives and permitted assigns) represented by U Zaw Win, Managing Director of RVS and its registered address at No.(80), Bo Aung Kyaw Road, Btataung Township, Yangon, the Republic of the Union of Myanmar for the purpose of signing the Deed of Assignment of the third part; and DEPP, CPIYN, AWC and RVS are collectively referred to as "the **Parties**" and individually as "a **Party**".

WHEREAS:

A. The Contract No. (68)/DHPI/2007-2008 (hereinafter referred to as "the Contract") for construction power project (Chipwi Nge) which was intended to be developed non-commercial nature for supplying and distributing the electricity for the development of hydropower projects in Maykha, Malikha and upstream of Ayeyawady-Myitsone River Basins (hereinafter referred to as "the Projects"), had been signed between Department of Hydropower Implementation, Ministry of Electric Power No. (1) (hereinafter referred to as "DHPI")and China Power Investment Corporation (hereinafter referred to as "CPI") on 27th February 2008.

B. The Parties agree that the Contract shall be automatically dissolved on the date on which the Joint Venture Agreement has become effective.

C. The Memorandum of Agreement for the development, operation and transfer of the hydropower projects in Maykha, Malikha and Up-stream of Ayeyawady-Myitsone river basins (hereinafter referred to as "MOA") signed between MOEP and CPI on 16th June 2009.

D. The Parties have the right to follow the provision stipulated in the Supplementary Agreement to MOA (hereinafter referred to as "Supplementary Agreement") signed between Department of Hydropower Planning (hereinafter referred to as "DHPP") and CPIYN on 20th January, 2015. DHPP, CPIYN and AWC, pursuant to the supplementary Agreement, signed the Joint Venture Agreement (hereinafter referred to as "JVA") in Nay Pyi Taw on 20th January, 2015.

E. Pursuant to the MOU, MOA and JVA, CPIYN has completed the Development Plan, Feasibility Study Report and Environmental Impact Assessment and Social Impact Assessment Report of Chipwi Nge Hydropower Project and submitted it to MOEP.

F. RVS was established in 29th January, 2013 and takes over AWC's rights, tittles, interests and obligations arising under the JVA.

G. The Government of the Republic of the Union of Myanmar formed MOEP joining MOEP (1) and MOEP (2) in September 2012.

H. MOEP and CPIYN have agreed to the assignment and transfer of AWC's rights and obligations in developing of Chipwi Nge hydropower project, stipulated in the JVA, to RVS.

IT IS HEREBY AGREED as follows:

1. AWC hereby unconditionally assigns and transfers all of its rights and obligations under the JVA to RVS from the date of signing this Deed of Assignment.
2. AWC will not be liable for any responsibility and obligations in connection with the JVA after aforesaid rights and obligations had been transferred to RVS from the date of signing this Deed of Assignment.
3. RVS agrees to take over AWC's rights and obligations in developing Chipwi

ဒု- ၆ - ၈- ၃၊

Nge hydropower project and act in accordance with the terms of the JVA from the date of signing of this Deed of Assignment.

4. DEPP agrees to the assignment, and will cooperate with RVS in support to implement the said project.

5. CPIYN agrees to the assignment and will cooperate with RVS to implement the said project.

6. This Deed of Assignment shall form an integral part of the JVA.

7. This Deed of Assignment shall be governed by and constructed in accordance with the laws of the Republic of the Union of Myanmar.

8. This Deed of Assignment shall come into effect from the date of signing by the parties concerned.

9. This Deed of Assignment is made eight originals in English, and two originals shall be held by each party.

IN WITNESS THEREOF, This Deed of Assignment has been duly executed on (22nd) October, 2015 by the duly authorized representatives of the Parties:

Signed for and on behalf of:

Department of Electric Power Planning

Ministry of Electric Power

The Republic of the Union of Myanmar

....

U Khin Maung Win

Director General

Signed for and on behalf of:

CPI Yunnan International Power

Investment Co., Ltd

The People's Republic of China

....

Mr. Wang Qi

Vice President

Signed for and on behalf of:

Asia World Co., Ltd.

The Republic of the Union of Myanmar

....

U Htun Myint Naing

Managing Director

Signed for and on behalf of:

Royal Victory Services Co., Ltd

The Republic of the Union of Myanmar

....

U Zaw Win

Managing Director

IN THE PRESENCE OF

Signed for and on behalf of:

Department of Electric power Planning

Ministry of Electric Power

The Republic of the Union of Myanmar

....

U Hein Htet

Deputy Director General

Signed for and on behalf of:

CPI Yunnan International Power

Investment Co., Ltd

The People's Republic of China

....

Mr. Cao Junhua

Vice President

Signed for and on behalf of:

Asia World Co., Ltd.

The Republic of the Union of Myanmar

....

U Sai Myint Thein

Director

Signed for and on behalf of:

Royal Victory Services Co., Ltd

The Republic of the Union of Myanmar

....

U Kyi Kyain

Director

Summary of Machinery and Equipment

No.	Description	Total(RMB)
1	Main imported heavy machinery	96,654,000
1.1	Dam civil works	48,207,300
1.2	Equipments intent to use for Headrace system and power house	48,446,700
2	Main imported electromechanical equipment	145,085,700
2.1	Power generation equipment	136,226,900
2.2	Metal structures equipment	8,858,800
3	Main imported transmission lines	34,194,600
4	Main imported monitoring instrument	2,393,520
5	Permanently imported vehicles	10,500,000
Total		**288,827,820**

1. Main already imported and drawn back heavy machinery, quantities & value

No.	Name of equipments	Specification	Unit price （$\times 10^4$ RMB）	Qty	Total （$\times 10^4$ RMB）
I	**DAM CIVIL WORKS**				**4820.73**
1	TRANSPORTAION EQUIPEMENTS				
	Dump truck 20ton	BZJ3364　20t	32.8	13	426.4
	Dump truck 8ton	DONGFENG（8t）	19.7	6	118.2
	Concrete agitator	3.0m3	45	3	135
	Concrete agitator	6.0m3	75	6	450
	Flat bed truck 8ton	DONGFENG（8t）	19.6	2	39.2
	Flat bed truck 10 ton	EQ-155A 10t	24	2	48
	Explosive transportation truck	5t	12	1	12
	Water tank	EQ140　5t	21	2	42
	Mimi-truck	CA1046L2	8.14	1	8.14
	Diesel tank	TN151　 8t	21	2	42
	Trailer	30t	39	1	39
2	EXCAVATION EQUIPMENTS				
	Hydraulic excavator	CAT1.6m3	142	2	284
	Hydraulic excavator	CAT　1.0m3	64.8	1	64.8
	Wheal loader	ZL50G　3.0 m3	30.2	4	120.8
	Bulldozer	D85A-12	72.45	1	72.45
	Loader-excavator	LWT-60	8	2	16
	Hydraulic drilling machine	CM351	31	1	31
	Shallow-hole drill	QZJ-100	1.63	8	13.04
	Earth anchor drill	XJ－100	0.8	3	2.4
	Rock anchor drill	YG60	3.5	1	3.5
	Diesel air compressor	VHP750　20m3/min	8.5	1	8.5
	Diesel air compressor	VY-9/7　 9m3/min	4.9	2	9.8
	Diesel air compressor	4L-12/8　12m3/min	7.8	2	15.6
	Diesel air compressor	4L-20/8　20m3/min	8.5	4	34
	Pneumatic drill	YT-28	0.7	18	12.6
	Pneumatic drill	YTP-27	0.55	20	11
	Pneumatic drill	YT-25	0.34	5	1.7
	Axial-flow fan	TF90-1（37kW）	1.6	2	3.2
	Vibration roller	12.5 ｔ	20	1	20
3	CONCRETE PLACING EQUIPMENT				
	Stationary concrete pump	HBT-65 60m3/H	16	2	32
	Overhead gantry crane	MQ900B（10/30t）	320	2	640

No.	Name of equipments	Specification	Unit price （×10^4 RMB）	Qty	Total （×10^4 RMB）
	Concrete conveyor-belt	TB105	45	1	45
	Steel formwork trolley		80	2	160
	Horizontal concrete tank	6m^3	5	1	5
	Horizontal concrete tank	3m^3	3	2	6
	High pressure jet	CM-45/160	9	3	27
	Water Sprayer		3	8	24
	Converter	ZJB200	2	10	20
	Vibration rod	φ80～φ130	0.5	60	30
	Vibrator	φ30～φ50	0.3	4	1.2
4	HOISTING EQUIPMENT				
	Winch	TM1（10t）	3.5	2	7
	Truck crane	QY-8 8t	16	2	32
	Truck crane	QY-16 16t	35	2	70
	Truck crane	50t	85	1	85
5	AGGREGATE PRODUCTION EQUIPMENT				
	Vibration feeder	ZSW490×110	15	1	15
	Jaw crusher	PEF900×1200	30	1	30
	Cone crusher	PYY-1650/285	80	1	80
	Electromagnetic ironwork catcher	RCDB-8A	5	1	5
	Vibration sieve	2YKR2052	21	1	21
	Vibration sieve	3YKR2052	28	1	28
	Vibration sieve	YKR1230	6	1	6
	Vibration feeder	GZG803	2	12	24
	Pneumatic gate	600×600	1	3	3
	Conveyor	B=800	9	4	36
	Conveyor	B=650	7	3	21
	Conveyor	B=500	5	11	55
6	BATCHING AND COOLING SYSTEM				
	Concrete batching plant	HZ120-2F3000	220	1	220
	Truck balance	ZCS-50DB	15	1	15
	Silo	400ton	36	2	72
	Silo	350ton in total	36	2	72
	dust collector	72bags	5	4	20
	Aerification pump	QPB6.0	15	3	45
	Two-way vale	DN125	3	3	9
	Anti- crussion pump	40AFB－20	5	4	20
	Vibration feeder	B1000×1000	2	9	18
	Motor drive gate	B800×800	1	3	3
	Conveyor	B1000/170m	15	2	30

No.	Name of equipments	Specification	Unit price （×10^4 RMB）	Qty	Total （×10^4 RMB）
7	DRILLING AND GROUTING EQUIPMENT				
	Concrete short machine	TK-961	39	3	117
	Grouting machine	MZ-1	5	4	20
	Grouting pump	2SNS	4	2	8
	Drill	XY-2PC	9	3	27
	Shallow hole drill	YQD-100	8	7	56
	Hi-speed mixer	NJ-600	2	3	6
	Low-speed mixer	1m3	1	3	3
	Mud-pump	BW-250/50	3	3	9
	double deck mixer	JJS-2B	1	3	3
	Grouting pump	SGB6-10	2	3	6
	Automatic recorder	GJY-III	2	6	12
	Pitch surveyor	KXP-1	3	2	6
	Ultrasonic-Pitch surveyor	CDJ-10	2	2	4
8	METAL STRUCTURE				
	electric welding	BX3-500	1	24	24
	Steel treatment machine		6	1	6
	Formwork fabricate machine		12	1	12
9	POWER SUPPLY				
	Diesel generator	400kw、0.4kv	38	1	38
	Diesel generator	400kw、0.4kv	38	4	152
	Diesel generator	300kw、0.4kv	30	2	60
	Diesel generator	200kw、0.4kv	22	1	22
	Diesel generator(movable)	25kw、0.4kv	8	4	32
	Power compensation board	0.4kv/300kF	3	3	9
	Switch board	0.4kv/2000kva	3	1	3
	Switch board	0.4kv/1000kva	3	1	3
	Switch board	0.4kv/500kva	2	3	6
10	WATER SUPPLY				
	Mud-pump	2SNS	4	2	8
	Water pump	65-30-40-7.5	2	4	8
	Water pump	IS80-50-200	4	1	4
11	TESTING MACHINE				
	Pull-strain jack	YCW250	9	1	9
	Pull strain jack	YDC250-150	9	1	9
	Anchor bar strainer	YC60B	0.6	2	1.2
	Cupper water-stop	Self-made	2	1	2

No.	Name of equipments	Specification	Unit price （×10^4 RMB）	Qty	Total （×10^4 RMB）
12	COMMUNICATION				
	Phone		0.05	20	1
	Phone exchanger		1	6	6
	Walk talk		0.2	40	8
	Walk talk-exchanger		1	4	4
II	**EQUIPMENTS INTENT TO USE FOR HEADRACE SYSTEM AND POWER HOUSE**				**4844.67**
1	SUPPORTING SYSTEM FOR EXCAVATION				
	Crawler shallow-hole drill	HCR1200-ED	31	1	31
	Light shallow-hole drill	QZJ-100B	2.1	6	12.6
	Pneumatic drill	YT-28	0.3	18	5.4
	Excavator	EX300，1.4m^3	90	2	180
	Excavator	EX210LC，1.0m^3	71	4	284
	Loader	ZL50C，3.0m^3	35	7	245
	Loader-excavator	LWT-60	8	6	48
	Driller	LM-300	120	2	240
	Bulldozer	TY220	75	1	75
	Concrete short machine	TK961	0.8	5	4
	Meister		25	8	200
	Dump truck	STYLE（15t）	25	6	150
	Dump truck	DONGFENG(5t）	6	14	84
	Vibration roller	20t	20	1	20
	Winch	12t	6.5	2	13
2	CONCRETE MACHINE				
	Concrete agitator truck	HTM604 6m^3	75	3	225
	Concrete agitator truck	3m^3	45	10	450
	Stationary concrete pump	HBT60	16	4	64
	Tower crane	C6024，12t	210	2	420
	Concrete tank	3m^3	1.5	2	3
		1m^3	0.8	2	1.6
	Steel Formwork trolley	L=10.5m	54	2	108
	Diesel tank	SGZ5210GJY	21	1	21
	Batching plant	HZS25	220	1	220
	Aggregate production system	38t/h	158	1	158
	Mixer	JZC350	1.2	4	4.8
	Water tank	CTT511GSS	3.85	1	3.85
3	GROUTING MACHINE				0
	High speed mixer	ZJ400	2.5	4	10
	double deck mixer	JJS-2B	3.2	8	25.6

No.	Name of equipments	Specification	Unit price（×10^4 RMB）	Qty	Total（×10^4 RMB）
	Grouting pump	SGB6-10	0.3	8	2.4
	Geological drill	XY-2PC	18.5	1	18.5
	Hole Block	φ56	0.2	20	4
	Automatic grouting recorder	GJY-Ⅳ	1.2	4	4.8
	sewage-pump	WQ50-6-3-4	0.5	4	2
	Ultrasonic	WSP-2	2.5	1	2.5
	Truck	EQ140/5t	4.8	1	4.8
4	TESTING MACHINE				
	Universal testing machine	WES-1000D	5.6	1	5.6
	Forced Concrete mixer	SDQ-1A	1.2	1	1.2
	Cement and sand mixer	NRJ-411B	0.85	1	0.85
	Cement and sand mixer vibration platform	GZ-85B	0.5	1	0.5
	Concrete (1m2)	ZHJ-A	0.5	2	1
	Concrete anti-permeameter	HS-40W	1.5	2	3
	Concrete flextural machine	HT-3000	1.5	1	1.5
	Concrete modules of elasticity		2.5	1	2.5
	Concrete penetration resistance dynamometer	GE-120-RT	1.4	1	1.4
	Mortar consistometer	SZ145	0.8	1	0.8
	Cement setting time apparatus		1.2	2	2.4
	Rock chipper	SCQ-1	2.3	1	2.3
	Mortar saturation instrument		0.8	2	1.6
	Precious Electronic balance	FA2004	0.5	1	0.5
	Analysis balance	TG928-B	1.5	1	1.5
	Liquid ratio balance	PC-B-5	0.8	2	1.6
	balance	200g/0.2g	0.3	1	0.3
		1000g/1.0g	0.5	1	0.5
	Table balance	AGT-10	0.6	2	1.2
	Balance	TGT-500A	0.35	3	1.05
	Bubble instrument	200ml	0.5	1	0.5
	Chemical testing machine	set	1.5	1	1.5
	Electronic water level	0.02mm/2m	2.5	1	2.5

No.	Name of equipments	Specification	Unit price (×10^4 RMB)	Qty	Total (×10^4 RMB)
	water level	Na30030.4mm/km	8.5	1	8.5
	Total station	TC2003 .5//,1mm+1ppm	12.8	3	38.4
5	GENERAL EQUPMENTS				
	Mini bus	19seats	13	2	26
	Land rover	Toyota 4000	35	1	35
	Pickup	Landwind	12	3	36
	Air compressor	VHP750W/21.2 m^3/min	18	10	180
	Air compressor	XP600E	15	2	30
		17 m^3/min			0
	Diesel generator	220GF/SY\	22	4	88
		220KW			0
	Diesel generator	250GF/SY\	26	6	156
		260KW			0
	Diesel generator	200GF/SY\	20	2	40
		200KW			0
	Diesel generator	150GF/SY\	15	4	60
		150 KW			0
	Diesel generator	100GF/SY\	10	1	10
		100 KW			0
	Diesel generator	400GF/SY\	15	1	15
		400 KW			0
	ventilation fan800 m3/min	2×55kw	5.6	5	28
		2×37kw	3.42	2	6.84
	Centrifugal pump	IS(H)100-65-200	1.5	8	12
	Sewage pump	80QW40-7-2.2	0.8	10	8
	Water pump	40QW15-15-1.5	0.25	10	2.5
	Rebar cutting machine	GQ40	0.29	2	0.58
	Rebar bending machine	GW40	0.15	2	0.3
	Rebar straighthen machine	GTJ4-4/14	0.35	1	0.35
	AC welding machine	BX3-500	0.17	6	1.02
	Mobile crane	QY25	35	1	35
	Mobile crane	QY8	16	2	32
6	METAL STRUCTURE				
	40t trailer	CWA54HTIZ	42	1	42
	Truck	EQ1108G6D14	8.5	2	17
	Mini bus	KLQ6601E	5.5	1	5.5

No.	Name of equipments	Specification	Unit price （×10^4 RMB）	Qty	Total （×10^4 RMB）
	Bus	XML6482EA	12	2	24
	Mobile crane	50t	85	1	85
	Jack	25t	0.5	4	2
	Fork-lift electricity drive	10t	5.3	1	5.3
	Fork-lift	5t、3t	1.2	1	1.2
	Truck	NHR55ELWXS	6.5	1	6.5
	Winch	5t	1.5	2	3
	Winch	8t	2.5	4	10
	Winch	10t	3.2	2	6.4
	Horizontal transport trolley	10t	15	2	30
	Horizontal transport trolley	20t	23	3	69
	Horizontal transport trolley	40t	35	1	35
	chain wheel	50t	3.5	2	7
	Trailer	30t	35	1	35
	Truck	20t	18	1	18
	Truck	16t	13.6	1	13.6
	Truck	10t	12	1	12
	sling	AROUND 36t	12	1	12
	Assemble platform	AROUND 4t	3.5	1	3.5
	Total station	TC2002	12.5	1	12.5
	Water lever	NA2+GPM3	8.5	1	8.5
	theodolite	T2	3.5	1	3.5
	Micrometer inside caliper	6M	0.25	1	0.25
	Resistance tester	JDC-1	0.5	1	0.5
	DC resistance tester	BKZ-C	0.8	1	0.8
	Undee recorder	DF1024D	2.3	1	2.3
	Test machine for HV switch	GKC-HIII	0.85	1	0.85
	Test machine for 3-Ph,DC	BD-1D	0.53	1	0.53
	Computer protection relay	WDJB	0.5	1	0.5
	Test machine for transform ratio	GCBG-3	1.2	1	1.2
	Digital Voltage meter	SGB-200	2.3	1	2.3
	DC anti-voltage instrument		5.5	1	5.5
	AC anti-voltage instrument		3.5	1	3.5

No.	Name of equipments	Specification	Unit price（×10^4 RMB）	Qty	Total（×10^4 RMB）
	Electronic voltage test pump	4D-SY 61/16	1.2	1	1.2
	Hand-set pressure test pump	4D-SY 61/16	0.6	1	0.6
	oven	Y2H2-150	0.75	1	0.75
	Welding rod oven	YGCH-G-150	0.5	1	0.5
	Contradictorily DC welder	ZX7-630S	2.5	5	12.5
	Contradictorily DC welder	ZX7-400S	1.8	5	9
	Si-commutate welder	ZXG-400B	3.2	10	32
	Argon-welder	AX7-500	2.5	3	7.5
	Air-protect welder	KEMPPIMIG500	1.5	6	9
	planer	B6066	3.2	1	3.2
	Lathe	CW6110V	1.5	1	1.5
	milling machine		3.6	1	3.6
	Sawing		1.85	1	1.85
	drill press	Z3080HX25	3.6	1	3.6
	Semi-automatic cutter	CGI-3QP	0.8	1	0.8
	Plasma cutter	LGK-60	1.2	1	1.2
	Automatic pipe bender	DWQJ-G108	2.8	1	2.8
	Al-bus bar welder		0.5	2	1
	Silver and cupper welder		0.75	2	1.5
	Ultrasonic inspector	CTS-23	3.25	1	3.25
	magnetic inspector	CJE-D	3.25	1	3.25
	X-ray inspector	RADIOFLZX-300GS3	1.2	1	1.2
	Air compressor	6 m^3/s	8	1	8
	Air compressor	0.9 m^3/8A	3	1	3
	Pressure diesel filter	YL100	3.2	1	3.2
	Vacumm diesel filter		5	1	5
	Dehumidizer machine	CH948B	1.2	4	4.8
	Air conditioner		0.5	4	2

2. Summary of main already imported electromechanical equipment, quantity & value

Part 1 Power Generation Equipment

S.N	Name of equipments	Unit	Quantity	Unit price（RMB）	Total（RMB）
1	**Turbine and accessories**	**Sets**	**3**	**5072884.67**	**15218654**
2	**Generator and accessories**	**Sets**	**3**	**7792641.67**	**23377925**
3	**Hydraulic Turbine Governor and accessories**	**Sets**	**3**	**1190752.33**	**3572257**
4	**Inlet valve and accessories**	**Sets**	**3**	**2338937.00**	**7016811**
5	**Excitation System**	**Sets**	**3**	**635884.33**	**1907653**
6	**Transforming system**	**Lot**	**1**	**34194600.0**	**34194600**
7	**Other equipments**				**47102310**
	Overhead crane	Set	1	4405532	4405532
	Computerized supervise system	Set	1	7552340	7552340
	Protection for generator and switch yard	Set	1	5034894	5034894
	IC system	Set	1	1258723	1258723
	Communication system	Set	1	6167745	6167745
	Control equipments for Public system	Set	1	2013957	2013957
	Automatic parts	Sets	3	88111	264332
	Compressed air system	Sets	5	327268	1636340
	Venture conditioning system and water supply system	Set	1	1636340	1636340
	Fire alarm system	Set	1	2895064	2895064
	Cable crack and fire-proof material	Set	1	503489	503489
	Power and lighting cabinet	Set	1	755234	755234
	Lighting system	Set	1	377617	377617
	Diesel generator	Set	1	1006979	1006979
	Filter system	Sets	12	75523	906281
	Water pump	Sets	11	75523	830757
	valve	Set	1	944043	944043
	10kV distribution cabinet	Set	1	4153787	4153787
	10kV insulated bus bar	Set	1	1888085	1888085
	10kV transformer	Set	1	1108558	1108558
	0.4kV distribution cabinet	Set	1	1762213	1762213
8	**Spare parts for generator/turbine and governor**	**Lot**	**1**	**2706487**	**2706487**

9	**Special tools for generator/turbine and governor**	**Lot**	**1**	**1130196**	**1130196**
Grand total					**136226900**

Part 2 Metal structures equipment

No.	Description	Unit	Qty.	Unit Price (RMB)	Amount (RMB)
1	**discharge and sediment**				**6967594**
	intake emergency maintenance gate unit weight 50t	t	50	16262.26	813113
	embedment unit weight 35t	t	35	13635.21	477232
	outlet radial gate unit weight 70t	t	70	19089.3	1336251
	embedment unit weight 20t	t	20	14998.73	299975
	fixed winch hoist unit weight 55t	Set	1	1654861	1654861
	hydraulic pressure hoist unit weight 50t	Set	1	2386162.19	2386162
2	**Headrace project**				**1891206**
	intake emergency maintenance gate unit weight 20t	t	20	16362.26	327245
	gate embedment unit weight 20t	t	20	13635.21	272704
	tail water maintenance gate unit weight 2t	t	2	16362.2	32724
	gate embedment unit weight 4t	t	12	13635.21	163623
	fixed winch hoist unit weight 4t	Set	1	119990	119990
	fixed winch hoist unit weight 25t	Set	1	749937	749937
	electomotion gourd unit weight 1t	Set	1	34090	34090
	trash rack	t	14	13635.21	190893
	Total				**8858800**

3. Summary of main already imported transmission lines, quantities & value (switch station)

Transformer Equipment

No.	name	unit	quantity	Unit price（RMB）	Total（RMB）
1	110kV primary transformer	set	3	5458200	16374600
2	110kV GIS	set	1	13360000	13360000
3	110kV outdoor equipment (including lightning arrester, voltage transformer, wave trapper, post insulator)	set	1	900000	900000
4	Power cable, control cable	set	1	3560000	3560000
Grand total					**34194600**

4. Summary of main already imported and drawn back monitoring instrument, quantities & value

No.	Name	Model	Unit price (RMB)	Amount	Total value ($\times 10^4$ RMB)
1	Universal testing machine	YE-2000E	78000	2	15.6
2	Universal testing machine	200t	100000	2	20
3	Strain measuring equipment for data		50000	2	10
4	Rangefinder	ME5000、ME3000	99800	2	19.96
5	Total Station	TC2002、TC1700	200000	4	80
6	Total Station	TC2003	100000	4	40
7	Electronic Level	0.02mm/2m	8400	1	0.84
8	Digital Level	NA3000、3003	75000	2	15
9	Concrete impermeability meter	HS-40W	18000	2	3.6
10	Concretes resiliometer	HT-3000	2000	2	0.4
11	Concrete elastic modulus cryoscopy	Dry apparent	980	2	0.196
12	Mortar consistency meter	SZ145	580	2	0.116
13	Concrete air content cryoscope	CA-3	1200	2	0.24
14	Altazimuth	T2	102000	2	20.4
15	Inclinometer	59309M	40000	1	4
16	Vibration meter		50000	1	5
17	Seismograph	R-24	40000	1	4
Grand Total					**239.352**

5. Summary of permanently already imported vehicles, quantities & value

No	Name	Amount	Unit price (× 10^4 RMB)	Total value (× 10^4 RMB)	Remark
1	Car	8	55	440	
2	Fire engine	2	80	160	15t
3	Car for daily use	2	25	50	
4	Medium passenger car	4	55	220	20 seats
5	Automobile crane	1	100	100	25t
6	Truck	4	20	80	8t/10t
Grand Total		**21**		**1050**	

Main already imported raw material, quantities & value

No.	Name & Specifications	Unit	Amount	Unit Price (RMB)	Value ($\times 10^4$ RMB)	Remark
1	Portland cement 32.5	t	6055	764.48	462.89	
2	Portland cement 42.5	t	18165	799.86	1452.95	
3	Medium-heat Portland cement 42.5	t	36330	852.94	3098.73	
4	Rebar	t	4688	5216.15	2445.33	
5	Timber	m^3	281	1234.95	34.70	
6	Board	m^3	1124	1929.92	216.92	
7	4# water proof rock ammonia dynamite	t	644.4	10200	657.29	
8	Gasoline	t	3	6814.83	2.04	
9	Diesel	t	6696	7192.27	4815.94	
Total					**13186.80**	

ချီဖွေငယ်ရေအားလျှပ်စစ်ဓာတ်အားပေးစက်ရုံ

ချီဖွေမြို့

စာအမှတ်၊ ၀၁၅ / စ – ၆(ဂ) / ခဖင / ၂၀၁၇

ရက်စွဲ ၊၂၀၁၇ ခုနှစ် ၊ဖေဖော်ဝါရီလ (၆)ရက်

သို့

ဝန်ကြီးချုပ်

ကချင်ပြည်နယ်အစိုးအရအဖွဲ့

မြစ်ကြီးနားမြို့

အကြောင်းအရာ။ **ချီဖွေငယ်ရေအားလျှပ်စစ်စီမံကိန်း မြေဧရိယာ (၂၂၂.၁၇)ဧကမှ မြေလွတ်၊ မြေရိုင်း (၂၂၀.၁၇) ဧက လယ်မြေ (၂) ဧကအား ဌာနပိုင်မြေ လျှောက်ထားနိုင်ရေး တင်ပြခြင်း**

ရည် ညွှန်း ချက် ။ (၁)ဝန်ကြီးချုပ်၊ကချင်ပြည်နယ်အစိုးရအဖွဲ့၏ (၆.၂.၂၀၁၂) ရက်စွဲပါ စာအမှတ်၊ ၁/၂-၆၁/၀၅ အစိုးရအဖွဲ့

(၂)လျှပ်စစ်စွမ်းအားဝန်ကြီးဌာန၊ရုံးချုပ်၏ (၁၈.၆.၂၀၁၄) ရက်စွဲပါ စာအမှတ်၊ ၅၁(က)-လျှပ်စစ်၁(၁)/၇၃၂၄/၂၀၁၄

၁။ အထက်အကြောင်းအရာပါ ကိစ္စနှင့်စပ်လျဉ်း၍ ချီဖွေငယ်ရေအားလျှပ်စစ် စီမံကိန်းကို လျှပ်စစ်စွမ်းအား ဝန်ကြီးဌာန၊ ရေအားလျှပ်စစ်အကောင်အထည်ဖော်ရေးဦးစီးဌာန၊CPIYN ကုမ္ပဏီနှင့် အေးရှားဝေါလ် ကုမ္ပဏီလီမိတက်တို့ အကျိုးတူပူးပေါင်း အကောင်အထည်ဖော်ဆောင်ရွက်ခဲ့ရာ (၂၀၁၁)ခုနှစ်၊ စက်တင်ဘာလတွင် ရာနှုန်းပြည့်ဆောင်ရွက်ပြီးဖြစ်ပါသည်။ ချီဖွေငယ်ရေအားလျှပ်စစ် စီမံကိန်း ဧရိယာတွင် ရစ်ဂျော်ကျေးရွာအုပ်စု၊ ကွင်းအမှတ်(OSS)၊ အုန်ချစ်ကွင်းမှ မြေလွတ်မြေရိုင်း ဧရိယာ (၁၂.၀၀) ဧက၊ မုတ်ဂေါင်ကွင်းမှ လယ်မြေ (၂.၀၀)ဧက နှင့် မြေလွတ်မြေရိုင်း (၁၃၁.၉၄)ဧက၊ လိုင်မာယန်ကျေးရွာအုပ်စုမှ ကွင်းအမှတ်(OSS) ၊ ဝမ်ထယ်ကွင်းမှ မြေလွတ်မြေရိုင်း (၄၀.၄၀)ဧက၊ နာမော်ဇွတ်ကျေးရွာအုပ်စု၊ကွင်းအမှတ်(OSS)၊ နန်းဦးကွင်းမှ မြေလွတ်မြေရိုင်း (၃၅.၈၃)ဧက၊ စုစုပေါင်းမြေ (၂၂၂.၁၇)ဧက တို့ပါဝင်ပါသည်။

၂။ စက်ရုံဧရိယာ နှင့် ပင်မတမံဧရိယာကြားတွင် လေ့ကားထစ် လယ်မြေ (၂)ကေ၊ ဥယျာဉ်ခြံမြေ (၂၀)ကေ၊ မြေလွတ်မြေရိုင်း (၂၀၀.၁၇)ကေ၊ စုစုပေါင်း (၂၂၂.၁၇)ကေ ရှိရာတွင် ၊ တမံအနီးရှိ လယ် (၂)ကေအတွက် နစ်နာကြေးပေးလျော်ပြီးဖြစ်ပါသည်။ ဥယျာဉ်ခြံမြေ (၂၀.၀၀)ကေအတွက် လျော်ကြေးငွေ (၁၀၃)သိန်းကျော်ပေးချေခဲ့ပြီး၊ မြေလွတ်မြေရိုင်းဧရိယာသို့ သွတ်သွင်းလျက် မြေလွတ် မြေရိုင်း စုစုပေါင်း (၂၂၀.၁၇) ဧက အား စက်ရုံပိုင်မြေ လျှောက်ထားနိုင်ရေးအတွက် ကချင်ပြည်နယ် အစိုးရအဖွဲ့မှ ရည်ညွှန်းချက် (၁) ပါစာ ဖြင့် မြေစာရင်း ပုံစံ (၁၀၅-၁၀၆) ရေးဆွဲခွင့်ကိုလည်း သဘောထားမှတ်ချက်ပြုပေးခဲ့ပြီးဖြစ်ပါသည်။ ယခုအခါ လျှောက်ထားမြေတွင် လယ်မြေ (၂.၀၀)ကေနှင့် မြေလွတ်မြေရိုင်း(၂၂၀.၁၇) ဧကတို့ ပါဝင်ရာ လယ်မြေကို လယ်မြေဥပဒေအရ အခြားနည်းအသုံးပြုခွင့် လျှောက်ထားရမည်ဖြစ်၍ မြေလွတ်မြေရိုင်းကို မြေလွတ်၊ မြေလပ် နှင့် မြေရိုင်းများ စီမံခန့်ခွဲရေး ဥပဒေ လျှောက်ထား ရမည် ဖြစ်ပါသည်။

၃။ ရည်ညွှန်းချက် (၂) ပါစာအရ လျှပ်စစ်စွမ်းအားဝန်ကြီးဌာနမှလည်း မြေလွတ်၊ မြေလပ်နှင့် မြေရိုင်းများ စီမံခန့်ခွဲရေးဗဟိုကော်မတီ၊လယ်ယာစိုက်ပျိုးရေးနှင့် ဆည်မြောင်းဝန်ကြီးဌာန သို့ စက်ရုံ၏ မြေဧရိယာ (၂၂၀.၁၇)ကေအတွက် မြေလွတ်၊ မြေရိုင်း လုပ်ပိုင်ခွင့် ရရှိရေးအတွက် လိုအပ်သလို ဆက်လက်ဆောင်ရွက်ပေးနိုင်ပါရန် ညှိနှိုင်းတင်ပြထားပြီးဖြစ်ပါသည်။ သို့သော် ပြည်နယ် မြေစာရင်းဦးစီးဌာနရုံးတွင် သွားရောက်စုံစမ်းရာ မြေစာရင်း ပုံစံ (၁၀၅-၁၀၆) ရေးဆွဲခွင့်အား ထပ်မံ၍ ပြန်လည် လျှောက်ထားရမည်ဖြစ်ကြောင်း စုံစမ်းသိရှိခဲ့ရပါသည်။

၄။ သို့ဖြစ်ပါ၍ ချီဖွေငယ်ရေအားလျှပ်စစ်စက်ရုံ ဧရိယာ နှင့် ပင်မတမံဧရိယာကြားရှိ မြေဧရိယာ (၂၂၂.၁၇)ကေ အား စက်ရုံပိုင်မြေအဖြစ် လျှောက်ထားနိုင်ရေးအတွက် ၎င်းဧရိယာတွင်ပါဝင်သည့် မြေလွတ်၊မြေရိုင်း (၂၂၀.၁၇)ကေအား မြေလွတ်မြေလပ်နှင့် မြေရိုင်း များစီမံခန့်ခွဲရေး ဥပဒေအတိုင်း ဆက်လက်တင်ပြ ဆောင်ရွက်ခွင့်ပြုပေးနိုင်ပါရန်နှင့် လယ်မြေ(၂.၀၀)ကေ အား အခြားနည်းသုံးစွဲခွင့် ရရှိရေးအတွက် လိုအပ်သလို စီမံညွှန်ကြားမှု ပြုပေးနိုင်ပါရန် လေးစားစွာဖြင့် တင်ပြအပ်ပါသည်။

ပူးတွဲလျက်-

(၁)ရည်ညွှန်းချက်(၁)ပါစာ	(၁)စောင်
(၂)ရည်ညွှန်းချက်(၂)ပါစာ	(၁)စောင်

(၃)အစိုးရက ခွင့်ပြုသော ဥပဒနှင့်ညီညွတ်သည့် အခြား လုပ်ငန်းများအတွက် လုပ်ပိုင်ခွင့်၊ အသုံးပြုခွင့်လျှောက်လွှာ (၂)ရွက်

(၄) ချီဖွေငယ်စက်ရုံ၏ လုပ်ငန်းစီမံချက်	(၃)ရွက်ပါ(၁)အုပ်
(၅) စက်ရုံပိုင် မြေလျှောက်ထားသည့် အခြေပြမြေပုံ	(၁)ရွက်
(၆) စက်ရုံ နှင့် ပင်မတာမံတည်နေရာပြမြေပုံ	(၁)ရွက်
(၇) ချီဖွေငယ်စက်ရုံ အကျယ်အဝန်းပြ ကောင်းကင်ဓာတ်ပုံ	(၁)ရွက်
(၈) ချီဖွေငယ်စက်ရုံပုံ	(၃)ရွက်
(၉) ရေသွယ်ဥမင်လိုဏ်များ၏ စနစ်ပြပုံ	(၁)ရွက်
(၁၀) ရေသွယ်ဥမင်လိုဏ်များ၏ စနစ်ပြကောင်းကင်ဓာတ်ပုံ	(၁)ရွက်
(၁၁) ပင်မတာမံအကျယ်အဝန်းပြ ကောင်းကင်ဓာတ်ပုံ	(၁)ရွက်
(၁၂) ပင်မတာမံပုံ	(၁)ရွက်

(ညာဏ်စိုး)
အင်ဂျင်နီယာမှူးကြီး၊ တာဝန်ခံအင်ဂျင်နီယာ
ချီဖွေငယ်ရေအားလျှပ်စစ်စက်ရုံ

မိတ္တူကို-

(၁)ဝန်ကြီး၊စိုက်ပျိုးရေးနှင့်မွေးမြူရေးဝန်ကြီးဌာန၊ကချင်ပြည်နယ်၊မြစ်ကြီးနားမြို့။

(၂) ပြည်နယ်ဦးစီးဌာနမှူး၊ပြည်နယ်မြေစာရင်းစီးဌာန၊မြစ်ကြီးနားမြို့။

(၃) ခရိုင်ဦးစီးဌာနမှူး၊ခရိုင်မြေစာရင်းဦးစီးဌာန၊မြစ်ကြီးနားမြို့။

(၄) ရုံးလက်ခံ။

ပြည်ထောင်စုသမ္မတမြန်မာနိုင်ငံတော်

ကချင်ပြည်နယ်အစိုးရအဖွဲ့ရုံး

စိုက်ပျိုးရေးနှင့်မွေးမြူရေးဝန်ကြီးဌာန

စာအမှတ်၊ ၁/၂-၆၁/၀၅(အစိုးရအဖွဲ့)
ရက်စွဲ၊ ၂၀၁၂ ခုနှစ်ဖေဖော်ဝါရီလ (၆)

သို့

ဒုတိယညွှန်ကြားရေးမှူး
ပြည်နယ်မြေစာရင်းဦးစီးဌာန
ကချင်ပြည်နယ်၊မြစ်ကြီးနားမြို့

အကြောင်းအရာ။ ချီဖွေငယ်ရေအားလျှပ်စစ် စီမံကိန်းမြေနေရာ(၂၂၂. ၁၇)ဧကအား မြေစာရင်း ပုံစံ (၁၀၅/၁၀၆)ရေးဆွဲခွင့်သဘောထားမှတ်ချက်ပြုရန်တင်ပြလာခြင်း

ရည်ညွှန်းချက်။ (၁) ပြည်နယ်မြေစာရင်းဦးစီးဌာနရုံး၏(၂၃. ၁၂. ၂၀၁၁)ရက်စွဲပါစာအမှတ် ၁၄၇၅/မအ-၂

အထက်အကြောင်းအရာပါကိစ္စနှင့်ပါတ်သက်၍ချီဖွေငယ်ရေအားလျှပ်စစ်စီမံကိန်းအတွက်လိုသောမြေနေရာ(၂၂၂. ၁၇)ဧကအား ဌာနပိုင်မြေနေရာအဖြစ်ရရှိရေးအတွက်မြေစာရင်းပုံစံ(၁၀၅/၁၀၆) ခွဲနိုင်ရေးအတွက်သဘောထားမှတ်ချက်ပြုပေးနိုင်ရန်ပြည်နယ်မြေစာရင်းဦးစီးဌာနမှအဖွဲ့စုံဖြင့်ကွင်းဆင်းစစ်ဆေးပြီးရည်ညွှန်းချက်ဖြင့်ခွင့်ပြုမိန့်ရရှိရေးအတွက်ကချင်ပြည်နယ်အစိုးရအဖွဲ့ရုံးသို့ ခွင့်ပြုမိန့်ချမှတ်ပေးနိုင်ရန်တင်ပြလာမှုအပေါ်ပြည်နယ်ဝန်ကြီးချုပ်မှ"မြေစာရင်းပုံစံ(၁၀၅/၁၀၆)ရေးဆွဲရန်ခွင့်ပြုသည်"ဟုမှတ်ချက်ပြုခဲ့ပါသည်။

သို့ဖြစ်ပါ၍သက်ဆိုင်ရာများမှ ဥပဒေလုပ်ထုံးလုပ်နည်းများအတိုင်း ဆက်လက်ဆောင်ရွက်နိုင်ရန်အတွက် ပြည်နယ်ဝန်ကြီးချုပ်၏ မှတ်ချက်နှင့်အညီ အကြောင်းကြားပါသည်။

6-2-12

(ဝန်ကြီးချုပ်ကိုယ်စား)
(ဘီထောဇောင်း၊ဝန်ကြီး)
စိုက်ပျိုးရေးနှင့်မွေးမြူရေးဝန်ကြီးဌာန
ကချင်ပြည်နယ်အစိုးရအဖွဲ့ရုံး

မိတ္တူကို-

-လက်ထောက်ညွှန်ကြားရေးမှူး၊ခရိုင်မြေစာရင်းဦးစီးဌာန၊မြစ်ကြီးနားမြို့

-ရုံးလက်ခံ

ပြည်ထောင်စုသမ္မတမြန်မာနိုင်ငံတော်အစိုးရ
လျှပ်စစ်စွမ်းအားဝန်ကြီးဌာန

စာအမှတ် ၊ ၅၁(က)-လျှပ်စစ် ၁(၁)/ ၇၃၂၄ /၂၀၁၄
ရက်စွဲ ၊ ၂၀၁၄ ခုနှစ် ၊ ဇွန်လ ၁၈ ရက်

သို့

ဥက္ကဋ္ဌ
မြေလွတ် ၊ မြေလပ်နှင့် မြေရိုင်းများ စီမံခန့်ခွဲရေးဗဟိုကော်မတီ
လယ်ယာစိုက်ပျိုးရေးနှင့် ဆည်မြောင်းဝန်ကြီးဌာန

အကြောင်းအရာ ။ **ချီဖွေငယ်ရေအားလျှပ်စစ်ဓာတ်အားပေးစက်ရုံ၏ မြေဧရိယာ (၂၂၀.၁၇) ဧက အတွက် မြေလွတ် ၊ မြေရိုင်းလုပ်ပိုင်ခွင့် အသုံးပြုခွင့် ရရှိရေး ဆောင်ရွက်ပေးနိုင်ပါရန်ကိစ္စ**

၁။ အထက်အကြောင်းအရာပါကိစ္စနှင့်ပတ်သက်၍ကချင်ပြည်နယ်၊မြစ်ကြီးနားခရိုင်၊ ချီဖွေမြို့နယ်ရှိ လျှပ်စစ်စွမ်းအားဝန်ကြီးဌာနနှင့် တရုတ်ပြည်သူ့သမ္မတနိုင်ငံ CPI Yunnan International Power Co.,Ltd. တို့ ပူးပေါင်းဆောင်ရွက်လျက်ရှိသည့် ချီဖွေငယ်ရေအားလျှပ်စစ်ဓာတ်အားပေးစက်ရုံအတွက် မြေရိုင်းဧရိယာ(၂၂၀.၁၇) ဧကအား အစိုးရကခွင့်ပြုသော ဥပဒေနှင့်ညီညွတ်သည့် အခြားလုပ်ငန်းများ အတွက် လုပ်ပိုင်ခွင့်၊ အသုံးပြုခွင့်ရရှိရေး လိုအပ်လျက်ရှိပါသည်။

၂။ သို့ဖြစ်ပါ၍ ချီဖွေငယ်ရေအားလျှပ်စစ်ဓာတ်အားပေးစက်ရုံ၏ စက်ရုံမြေနေရာ (၂၂၀.၁၇) ဧကအား အသုံးပြုခွင့်ရရှိရေးအတွက် လိုအပ်သလို ဆက်လက်ဆောင်ရွက်ပေးနိုင်ပါရန် ညှိနှိုင်းမေတ္တာ ရပ်ခံအပ်ပါသည်-

(က) အစိုးရကခွင့်ပြုသော ဥပဒေနှင့်ညီညွတ်သည့် အခြားလုပ်ငန်းများအတွက် (၂) စောင် လုပ်ပိုင်ခွင့် ၊ အသုံးပြုခွင့်လျှောက်လွှာ (မြေစာရင်းပုံစံ-၄)

(ခ) စကေးကိုက်မြေပုံ (၂) စောင်

(ဂ) ချီဖွေငယ်ရေအားလျှပ်စစ်ဓာတ်အားပေးစက်ရုံ၏ လုပ်ငန်းစီမံချက် (၂) စောင်

ပြည်ထောင်စုဝန်ကြီး (ကိုယ်စား)
(မင်းသော် ၊ ရုံးအဖွဲ့မှူး)

မိတ္တူကို
- ရေအားလျှပ်စစ်ဓာတ်အားထုတ်လုပ်ရေးလုပ်ငန်း
- ရုံးလက်ခံ

D:\2014 Work\Case (14).doc

035012

ပုံစံ - ၄

အစိုးရက ခွင့်ပြုသော ဥပဒေနှင့်ညီညွတ်သည့် အခြားလုပ်ငန်းများအတွက်

လုပ်ပိုင်ခွင့်၊ အသုံးပြုခွင့်လျှောက်လွှာ

သို့

မြေလွတ်၊မြေလပ်နှင့်မြေရိုင်းများစီမံခန့်ခွဲရေးဗဟိုကော်မတီ

နေပြည်တော်။

ရက်စွဲ၊ ၂၀၁၄ ခုနှစ်၊ ဇွန် လ ၁၁ ရက်

၁။ လျှောက်ထားသူအမည်/အဖွဲ့အစည်း ချီဖွေ့နယ် ရေအားလျှပ်စစ်ဓာတ်အားပေးစက်ရုံ

၂။ နိုင်ငံသား/အမျိုးသားစိစစ်ရေးကတ်အမှတ် ....

၃။ အဘအမည် ....

၄။ အလုပ်အကိုင် ....

၅။ အမြဲနေထိုင်သည့်နေရပ်လိပ်စာ ကချင်ပြည်နယ် ၊ ချီဖွေ့မြို့.........

၆။ လျှောက်ထားသည့်မြေလွတ်၊မြေလပ်၊မြေရိုင်းနှင့် စပ်လျဉ်းသည့် အချက်အလက်များ

ကချင် တိုင်းဒေသကြီး/ပြည်နယ်၊ မြစ်ကြီးနား ခရိုင်

မြို့နယ်	ရပ်ကွက်/ ကျေးရွာအုပ်စု	ကွင်း		ဦးပိုင်/ မြေကွက် အမှတ်	မြေ အမျိုး အစား	ဧရိယာ (ဧက)	မှတ်ချက်
		အမှတ်	အမည်				
၁	၂	၃	၄	၅	၆	၇	၈
ချီဖွေ့	ရစ်ကျော်	၀၅၅	ဆွန်ချစ်	-	မြေဦး	၁၂.၀	
,,	ရစ်ကျော်	၀၅၅	မူတ်ကောင်း	-	မြေဦး	၁၃၁.၉၄	
,,	လိုင်မာယန်	၀၅၅	ဝမ်ထယ်	-	မြေဦး	၄၀.၄	
,,	နမော်ဇွတ်	၀၅၅	နန်းဦး	-	မြေဦး	၃၅.၇၃	
				စုစုပေါင်း	မြေဦး	၂၂၀.၁၇	

အထက်ဖော်ပြပါမြေအတွက် သက်ဆိုင်ရာမြေစာရင်းဦးစီးဌာနမှ မှန်ကန်ကြောင်း သက်သေခံ လက်မှတ်ရေးထိုးထားသည့်မြေပုံ (၂)ပုံ ပူးတွဲတင်ပြပါသည်။

မှတ်ချက်။ မြေစာရင်းဦးစီးဌာန၏ ကွင်းမြေပုံတွင် ဦးပိုင်အမှတ် မပေးရသေးသောမြေဖြစ်ပါက ပုံကြမ်း (၂) ပုံသာ ပူးတွဲတင်ပြရမည်။

၇။ လုပ်ကိုင်လိုသည့် လုပ်ငန်း အကြီးစား ရေအားလျှပ်စစ်စက်ရုံ တည်ဆောက်၍ လျှပ်စစ်ဓာတ်အား ရောင်းချ လုပ်ငန်း။

၈။ လျှောက်ထားသူသည် မြန်မာနိုင်ငံသား/ နိုင်ငံခြားသား / မြန်မာနိုင်ငံသားများသာပါဝင်သော အဖွဲ့အစည်း/ နိုင်ငံခြားသားပါဝင်သောအဖွဲ့အစည်း ဖြစ်ပါသည်။

၉။ မြေလွတ်၊ မြေလပ်နှင့် မြေရိုင်းများ စီမံခန့်ခွဲရေး ဥပဒေ၊ နည်းဥပဒေများပါ စည်းကမ်းချက်များနှင့် ဗဟိုကော်မတီမှ သတ်မှတ်သည့် စည်းကမ်းများကို လိုက်နာပါမည်။

၁၀။ သတ်မှတ်ထားသော အာမခံကြေးငွေကို ပေးသွင်းပါမည်။

၁၁။ ကောက်ခံမည့် မြေခွန်များကို သတ်မှတ်ကာလအတွင်း ပေးသွင်းပါမည်။

၁၂။ တည်ဆဲဥပဒေနှင့်အညီ ဖွဲ့စည်းတည်ထောင်ထားသော အဖွဲ့အစည်း ဖြစ်ပါသည်။ အဖွဲ့အစည်း တည်နေရာ၊ မှတ်ပုံတင်အမှတ်၊ မှတ်ပုံတင်သည့်နေ့စွဲနှင့် အသင်းသားဦးရေစာရင်းတို့ကို ပူးတွဲတင်ပြပါသည်။

၁၃။ လျှောက်ထားသော လုပ်ငန်းအတွက် လုံလောက်သောမတည်ရင်းနှီးငွေ ရှိကြောင်း ခိုင်လုံသော အထောက်အထားပူးတွဲတင်ပြပါသည်။

၁၄။ အကောင်အထည်ဖော်မည့် လုပ်ငန်းစီမံချက်ကို ပူးတွဲတင်ပြပါသည်။

လျှောက်ထားသူလက်မှတ်

(ဦးထိန်နိုး)
တာဝန်ခံအင်ဂျင်နီယာ
ရွှေလီ ရေအားလျှပ်စစ်စက်ရုံ

လျှောက်လွှာလက်ခံရရှိသူလက်မှတ်၊------------------------

လက်ခံသူအမည်/ရာထူး၊------------------------

လက်ခံရရှိသည့်နေ့စွဲ/နေရာ၊------------------------

ပြည်ထောင်စုသမ္မတမြန်မာနိုင်ငံတော်အစိုးရ

လျှပ်စစ်နှင့်စွမ်းအင်ဝန်ကြီးဌာန

လျှပ်စစ်ဓာတ်အားထုတ်လုပ်ရေးလုပ်ငန်း

ချီဖွေငယ်ရေအားလျှပ်စစ်ဓာတ်အားပေးစက်ရုံ

ကချင်ပြည်နယ်၊မြစ်ကြီးနားခရိုင်၊ချီဖွေမြို့နယ်

မြေလွတ်၊မြေရိုင်းဧရိယာ(၂၂၀.၁၇)ဧက အား
စက်ရုံပိုင်မြေသိမ်းဆည်းရေးအတွက်
ချီဖွေငယ်ရေအားလျှပ်စစ်ဓာတ်အားပေးစက်ရုံ၏
လုပ်ငန်းစီမံချက်

၂၀၁၇ ခုနှစ်၊ဖေဖော်ဝါရီလ (၆)ရက်

ချီဖွေငယ်ရေအားလျှပ်စစ်ဓါတ်အားပေးစက်ရုံ၏လုပ်ငန်းစီမံချက်

နိဒါန်း

၁။ လျှပ်စစ်နှင့်စွမ်းအင်ဝန်ကြီးဌာန၊ လျှပ်စစ်ဓာတ်အားထုတ်လုပ်ရေးလုပ်ငန်း ကွပ်ကဲမှုအောက်ရှိ ချီဖွေငယ်ရေအားလျှပ်စစ်ဓာတ်အားပေးစက်ရုံ သည် ချီဖွေမြို့၏ အရှေ့တောင်ဘက် (၁၁) မိုင် အကွာတွင် တည်ရှိ ပါသည်။ ချီဖွေချောင်းပေါ်တွင် ကွန်ကရစ်ရေလှောင်တမံတည်ဆောက်၍ ရေသိုလှောင်ထိန်းသိမ်းရယူပြီး၊ ၎င်းတမံနေရာမှ အနောက်ဘက်သို့ (၆.၉) မိုင် ရှည်လျားသော ဥမှင်လိုဏ်ဖောက်ကာ ဖိအားမြင့် ပိုက်လိုင်း(Penstock) ဖြင့် ရေကိုရယူပြီး ချီဖွေမြို့၏အနောက်တောင်ဘက် (၆) မိုင်အကွာ မေခမြစ် အရှေ့ဘက် ကမ်းပေါ်တွင် (၉၉) မဂ္ဂါဝပ်အင်အားရှိသော လျှပ်စစ်ဓာတ်အားထုတ်လုပ်ပေးနိုင်သည့် အကြီးစား ရေအားလျှပ်စစ်ဓါတ်အားပေးစက်ရုံ တစ်ရုံဖြစ်ပါသည်။ ကချင်ပြည်နယ်နှင့် စစ်ကိုင်းတိုင်းဒေသကြီးအတွင်းရှိ မြို့နယ်၊ ကျေးရွာများသို့ လျှပ်စစ်ဓာတ်အား ထုတ်လုပ်ဖြန့်ဖြူးပေးနိုင်ရေး အတွက် တည်ဆောက်ထားခြင်းဖြစ်ပါသည်။

တည်နေရာ

၂။ ကချင်ပြည်နယ်၊ မြစ်ကြီးနားခရိုင်၊ ချီဖွေမြို့၏ အနောက်တောင်ဘက် (၆) မိုင် အကွာ မေခမြစ် ၏အရှေ့ဘက်ကမ်းပေါ်တွင်တည်ရှိပြီးစက်ရုံမြေနေရာ ၊ (၆.၉) မိုင် ရှည်လျားသော ရေသွယ်ဥမင်လိုဏ်နှင့် ချဉ်းကပ်ဥမင်လိုဏ် (Adit) မြေနေရာများအတွက် မြေလွတ်၊ မြေလပ်နှင့် မြေရိုင်း(၂၂၀.၁၇)ဧက အသုံးပြုရ မည်ဖြစ်ပါသည်။

ရည်ရွယ်ချက်

၃။ အကောင်အထည်ဖော်တည်ဆောက်ပြီးစီးခဲ့သော (၉၉)မဂ္ဂါဝပ်ထုတ်လုပ်ပေးနိုင်သည့် ချီဖွေငယ်ရေအားလျှပ်စစ် ဓာတ်အားပေးစက်ရုံနှင့် ဆက်စပ်အဆောက်အဦများဖြစ်သည့် ပင်မတမံ၊ ရေလှောင်တမံ၊ ရေလှောင်ကန်၊ ရေသွယ်ဥမင် လိုဏ်ခေါင်း၊ ရေသွယ်ဥမှင်လိုဏ် တလျှောက်ရှိ ချဉ်းကပ်ဥမင်လိုဏ်ဝင်ပေါက် (Adit) (၆)ပေါက်၊ ဝန်ထမ်းအိမ်ယာများ၊ စီမံကိန်းသုံး အဆောက်အဦများ၊ ပစ္စည်းသိုလှောင်ဝန်းများအား လုပ်ငန်းလိုအပ်ချက်အရ နိုင်ငံတော်အစိုးရ၏ ခွင့်ပြုချက်ဖြင့် တည်ဆောက်ခဲ့ရခြင်းဖြစ်ပါသည်။

စက်များမောင်းနှင်လည်ပတ်ပုံ

၄။ ချီဖွေချောင်းပေါ်တွင် ကွန်ကရစ်တမံတည်ဆောက်၍ ရေလှောင်ကန်ဖြင့် ရေကိုသိုလှောင်ထိန်းသိမ်းပြီး (၆.၉)မိုင် ရှည်လျားသောဥမင်လိုဏ်အတွင်းရှိ ရေသွယ်ပိုက်လိုင်းများဖြင့် ရေကိုယူ၍၊ (Penstock) ဖိအားမြှင့်ပိုက်လိုင်းဖြင့် စက်ရုံသို့ ရေကိုတွန်းပို့ပြီး (Turbine)နှင့် (Generator)စက်များကို လည်ပတ်စေကာ လျှပ်စစ်ဓါတ်အားထုတ်လုပ်၍ ၁၁၀ ကေဗွီဓါတ်အားလိုင်းများဖြင့် ဝိုင်းမော်ပင်မဓာတ်အားခွဲရုံသို့ ပို့လွှတ်ပြီး လျှပ်စစ်ဓါတ်အား ဖြန့်ဖြူးပါသည်။

စက်ရုံရှိဝန်ထမ်းဦးရေစာရင်း

၅။ ချီဖွေငယ်ရေအားလျှပ်စစ်ဓာတ်အားပေးစက်ရုံတွင် တာဝန်ထမ်းဆောင်လျက်ရှိသော မြန်မာ/တရုတ် ဝန်ထမ်းအင်အားစာရင်းမှာ အောက်ပါအတိုင်းဖြစ်ပြီး၊ လျှပ်စစ်နှင့်စွမ်းအင်ဝန်ကြီးဌာန၊ လျှပ်စစ်ဓာတ်အားထုတ်လုပ်ရေးလုပ်ငန်းမှ အင်ဂျင်နီယာ ဝန်ထမ်း (၁၂)ဦး နှင့် တရုတ်ပြည်သူ့သမ္မတနိုင်ငံ CPI Yunnan International Company ၏ OPERATING COMPANY ခွဲမှဝန်ထမ်း(၁၅)ဦး၊ ကုမ္ပဏီခန့် မြန်မာဝန်ထမ်း (၄၁) ဦး၊ စုစုပေါင်း ဝန်ထမ်း (၆၈) ဦးဖြင့် ပူးတွဲတာဝန်ထမ်းဆောင်လျှက်ရှိပါသည်။ ဓာတ်အားပေးစက်များ အား နေ့/ည အဆက်မပြတ်မောင်းနှင်၍ နိုင်ငံတော်၏ ဓာတ်အား လိုအပ်ချက်များအား ဖြည့်ဆည်းပေး လျက်ရှိပါသည်။

(က) မြန်မာ(နိုင်ငံ့ဝန်ထမ်း) ။ အရာထမ်း(၇)ဦး ၊ အမှုထမ်း(၃)ဦး၊ ပေါင်း(၁၀)ဦး၊ တွဲဘက် အမှုထမ်း(၂)ဦး၊ စုစုပေါင်း (၁၂)ဦး။

(ခ) တရုတ်ဝန်ထမ်း။ အရာထမ်း/အမှုထမ်း ၊ စုစုပေါင်း (၁၅)ဦး။

(ဂ) ကုမ္ပဏီခန့် မြန်မာဝန်ထမ်း

(၁) စက်ရုံလုပ်ငန်း။ B.E ဘွဲ့ရ ကျား (၂) ဦး၊ မ (၅) ဦး၊ B.Tech ဘွဲ့ရ ကျား (၂) ဦး၊AGTI ဘွဲ့ရ ကျား(၁)ဦး၊ ရိုးရိုးဘွဲ့ရ ကျား (၅) ဦး၊ မ (၁)ဦး၊ စုစုပေါင်း (၁၆) ဦး။

(၂) အထွေထွေလုပ်ငန်း။ စကားပြန် ကျား (၂)၊ မ (၂) ပေါင်း (၄) ဦး၊ အထွေထွေလုပ်သား ကျား(၁၁)၊ မ(၇) ပေါင်း (၂၂) ဦး၊ ယာဉ်မောင်း ကျား (၃) ဦး၊ စုစုပေါင်း (၂၅)ဦး။

စက်ရုံ၏ငွေကြေးသုံးစွဲမှု

၆။ ချီဖွေငယ်ရေအားလျှပ်စစ်ဓာတ်အားပေးစက်ရုံသည် လျှပ်စစ်စွမ်းအားဝန်ကြီးဌာနနှင့် တရုတ်ပြည်သူ့သမ္မတနိုင်ငံ၊(CPIYN)ကုမ္ပဏီတို့ အကျိုးတူပူးပေါင်းတည်ဆောက်ထားသော (JV) စက်ရုံ ဖြစ်သည့်အတွက် ငွေကြေးသုံးစွဲမှုအပိုင်းတွင် လျှပ်စစ်စွမ်းအားဝန်ကြီးဌာနနှင့် (CPIYN) ကုမ္ပဏီတို့မှ အချိုးကျစိုက်ထုတ်သုံးစွဲပါသည်။

နိဂုံး

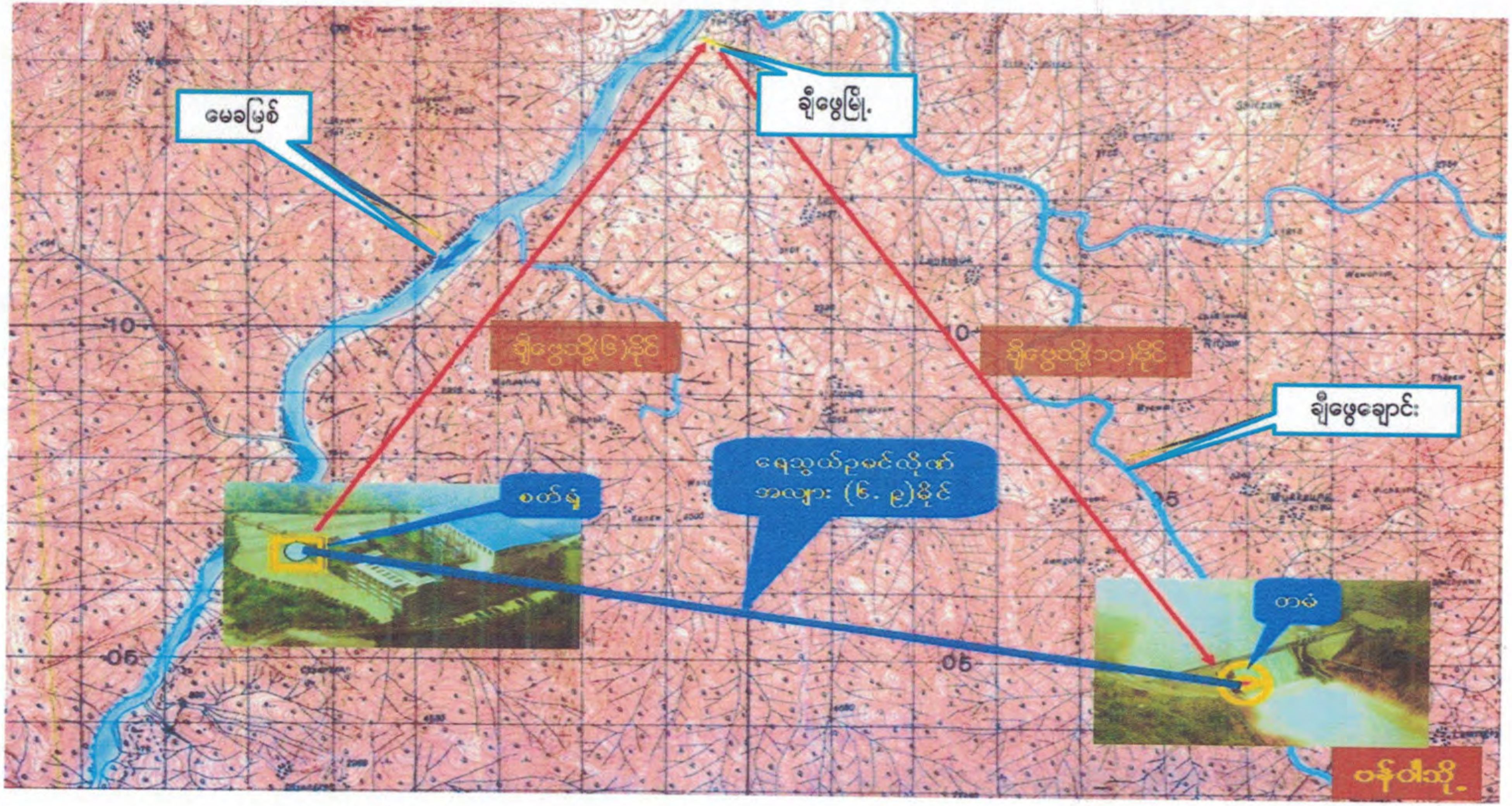
၇။ လျှပ်စစ်စွမ်းအားဝန်ကြီးဌာန၊လျှပ်စစ်ဓာတ်အားထုတ်လုပ်ရေးလုပ်ငန်းကွပ်ကဲမှုအောက်ရှိ ချီဖွေငယ်ရေအားလျှပ်စစ်ဓာတ်အားပေးစက်ရုံသည် ကချင်ပြည်နယ်နှင့် စစ်ကိုင်းတိုင်း ဒေသကြီး အတွင်းရှိ မြို့နယ်/ကျေးရွာများဖွံ့ဖြိုးတိုးတက်ရေးအတွက် လျှပ်စစ်ဓာတ်အား ထုတ်လုပ် ဖြန့်ဖြူးပေးလျက်ရှိပြီး၊ ပိုလျှံသော ဓာတ်အားများကို နိုင်ငံတော်၏ အခြားဒေသများသို့ National Grid မှတဆင့် ဖြည့်ဆည်းပို့လွှတ်ပေးနိုင်ရန် စီစဉ်ဆောင်ရွက်ပေးလျက်ရှိပါကြောင်း တင်ပြအပ်ပါသည်။

(ဉာဏ်စိုး)
အင်ဂျင်နီယာမှူးကြီး၊ တာဝန်ခံအင်ဂျင်နီယာ
ချီဖွေငယ်ရေအားလျှပ်စစ်စက်ရုံ

ချီဖွေငယ်ရေအားလျှပ်စစ်ဓါတ်အားပေးစက်ရုံပိုင်မြေလျှောက်ထားသည့်အခြေပြမြေပုံ

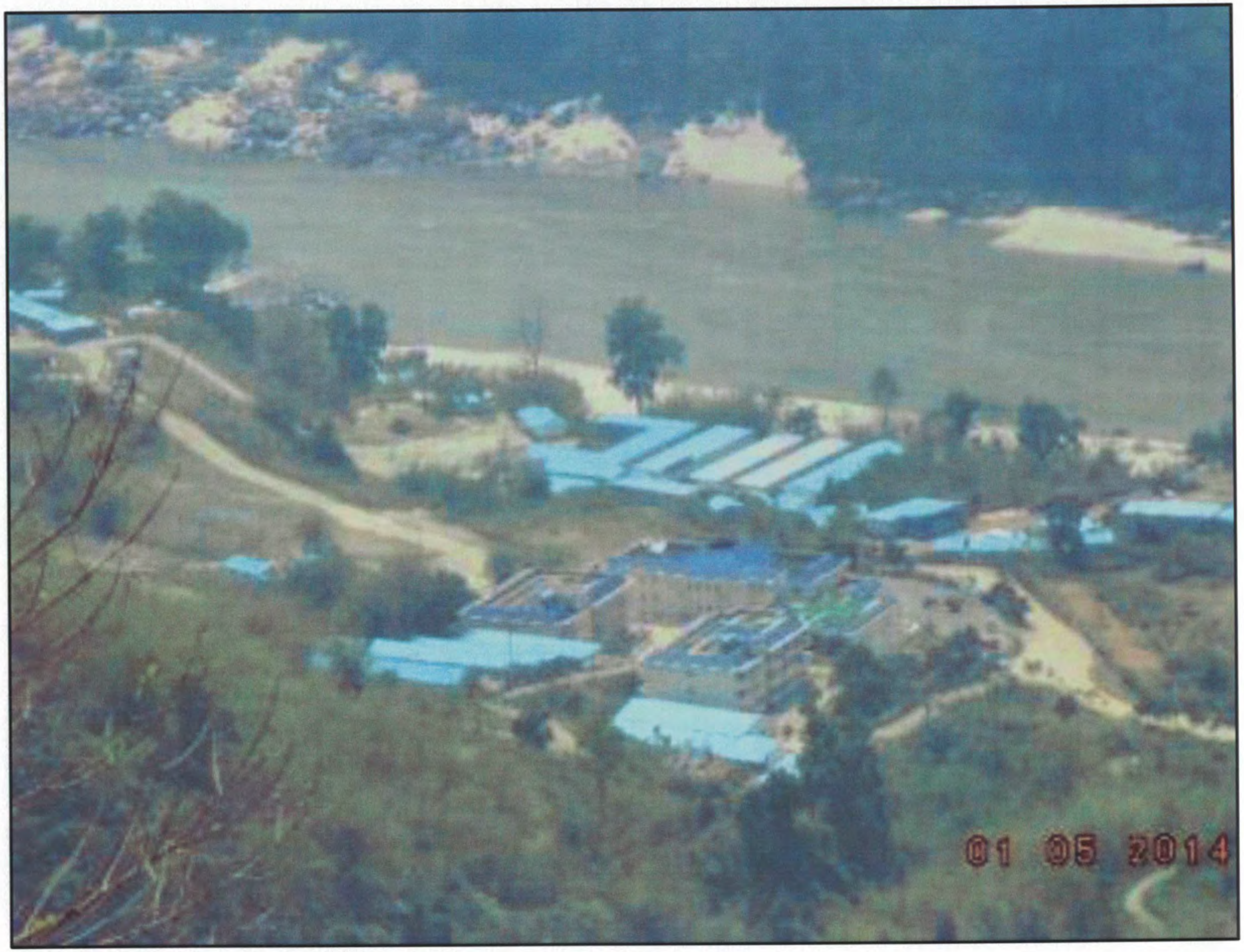


ချီဖွေငယ်ရေအားလျှပ်စစ်ဓာတ်အားပေးစက်ရုံ/ပင်မတာမံ တည်နေရာပြမြေပုံ




N
©2014 Google
©2014 Mapabc.com
Image ©2014 DigitalGlobe
Google
©2010
Imagery Date: 10/31/2013
2004
25°49'59.45" N 98°04'50.67" E elev 841 ft
Eye alt 2223 ft

စက်ရုံဧရိယာပုံ



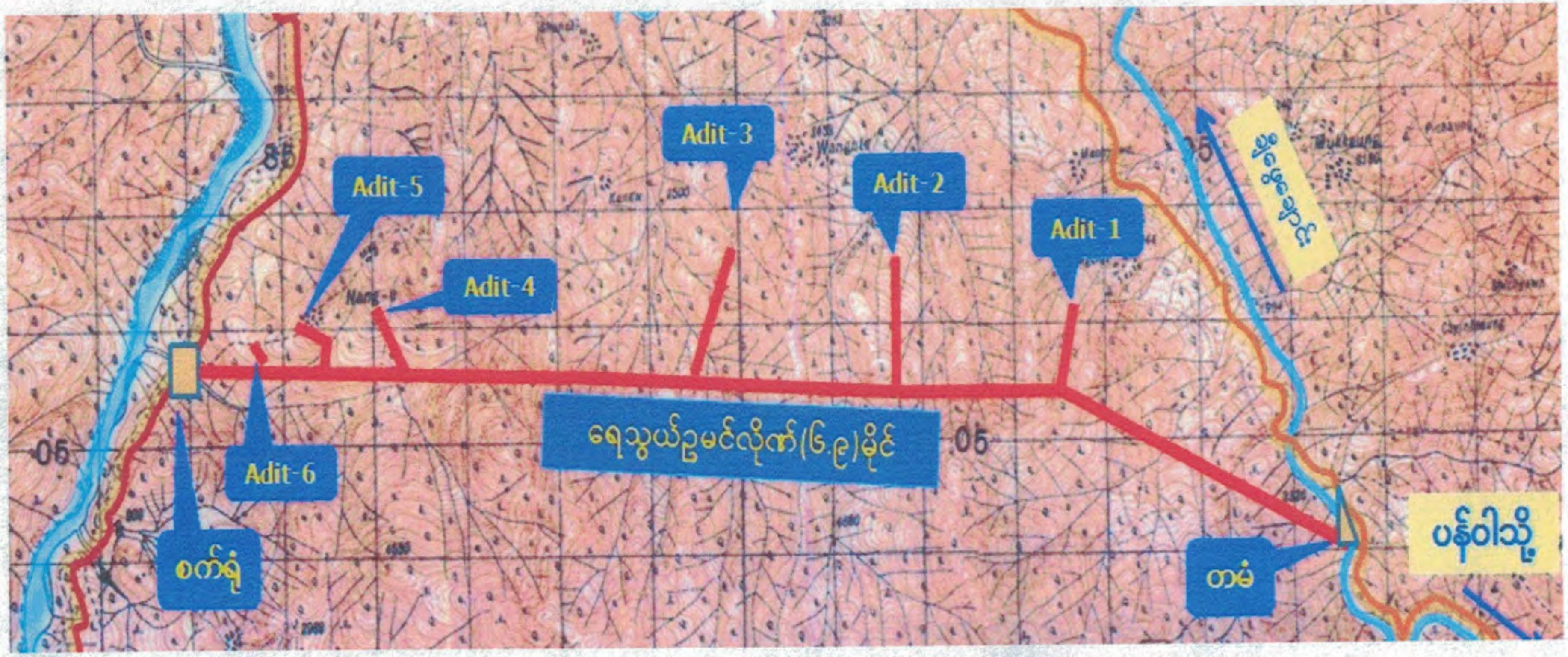
ဓာတ်အားပေးစက်ရုံပုံ



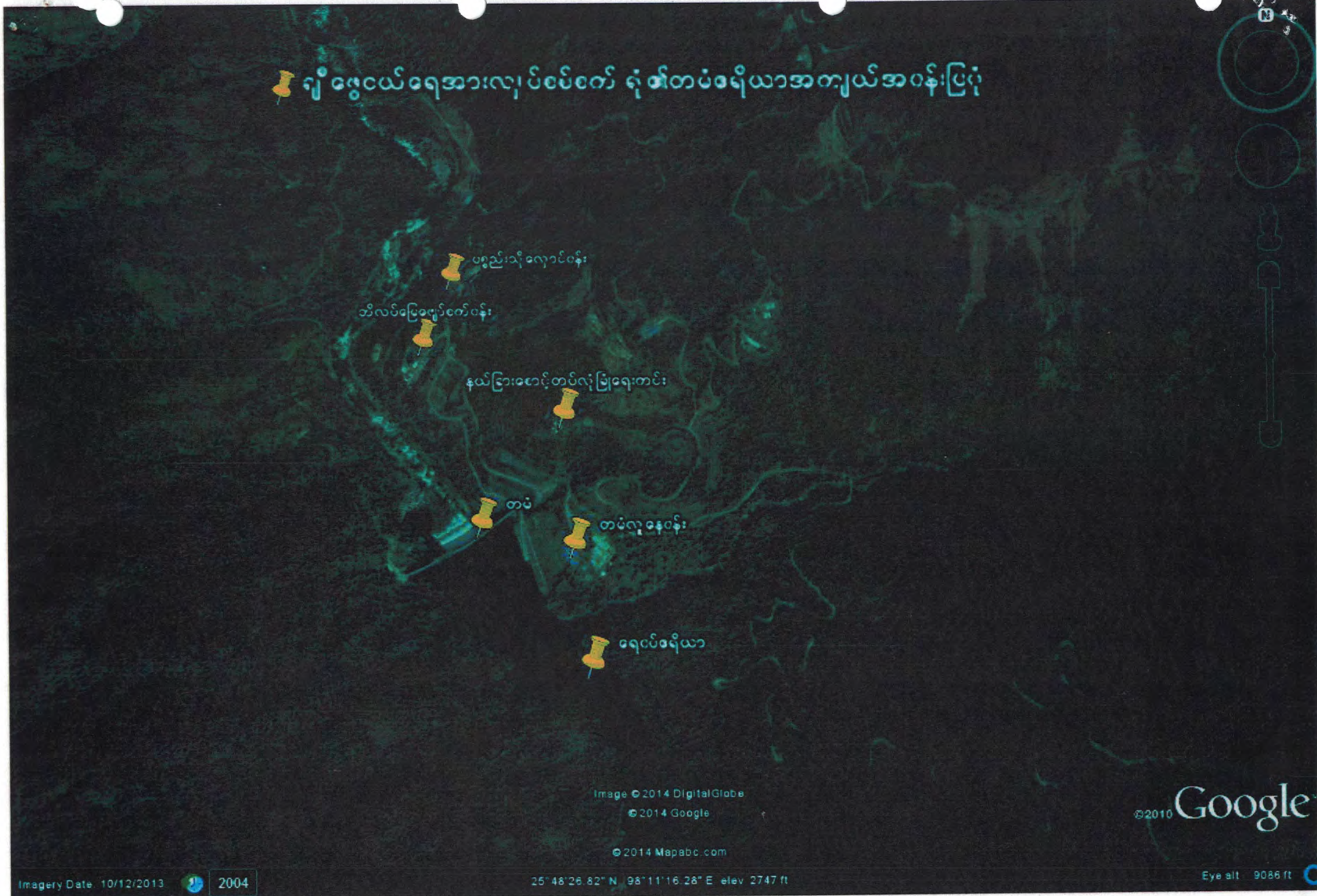
ဝန်ထမ်းအိပ်ဆောင်ပုံ



ချီဖွေငယ်ရေအားလျှပ်စစ်စီမံကိန်း စက်ရုံ/ရေသွယ်ဥမင်လိုဏ်/ချဉ်းကပ်ဥမင်လိုဏ်နှင့် ပင်မတာမံ စနစ်ပြပုံ




Edit6
Edit4
Edit5
Edit3
Edit2
Edit1
© 2014 Mapabc.com
© 2014 Google
Image © 2014 DigitalGlobe
©2010 Google


ချီဖွေငယ်ရေအားလျှပ်စစ်စက် ရုံ၏တမံဧရိယာအကျယ်အဝန်းပြပုံ
ပစ္စည်းသိုလှောင်ဝန်း
ဘိလပ်မြေဖျော်စက်ဝန်း
နယ်ခြားစောင့်တပ်လုံခြုံရေးတင်း
တမံ
တမံလုပ်သားနေဝန်း
ရေလှောင်ဧရိယာ
Image © 2014 DigitalGlobe
© 2014 Google
© 2014 Mapabc.com
©2010 Google
Imagery Date 10/12/2013
2004
25°48'26.82" N 98°11'16.28" E elev 2747 ft
Eye alt 9086 ft

ပင်မတာမံပုံ



During the construction period, the estimated utilized working hours is 9.6 million, and the estimated utilized manpower is around 1310 persons, in which there are about 480 local persons.

During the operation period, the estimated utilized manpower is around 90 persons, in which there are about 30 local persons.

1. Estimated manpower list for Construction Period

No.	Categories	Chinese	Myanmar
1	Construction management	60	20
2	Civil works of Dam construction	180	100
3	Civil works of powerhouse construction	150	80
4	Civil works of headrace system construction	250	110
5	Access construction	30	15
6	Prototype monitor and survey	10	5
7	Foundation treatment	30	20
8	Electromechanical equipment installation	50	30
9	Others	70	100
Total		830	480

2. Estimated manpower list for Operation Period

No.	Categories	Chinese	Myanmar
1	Manager level	3	1
2	Senior management level	4	2
3	Middle-level cadres	4	16
4	Operation and maintenance personnel	5	25
5	Service personnel	0	20
Sub-total		16	64
Total		80	

Description:

1. The operation and maintenance personnel and service personnel are mainly from the local recruitment;

2. Middle-level cadres and senior management will gradually hire local staff.

3. Wage Standard for Operation Period

Unit: RMB (Equivalent USD)/Month

No.	Categories	Chinese		Myanmar	
		RMB	Equivalent USD	RMB	Equivalent USD
1	Manager level	12000-16000	1951-2601	6000-8000	975-1300
2	Senior management level	8000-12000	1300-1951	4500-6000	731-975
3	Middle-level cadres	5000-8000	813-1300	3500-4500	569-731
4	Operation and maintenance personnel	4000-5000	650-813	3000-4000	488-650
5	Service personnel	None	None	2500-3000	406-488

Description:

Exchange rate: 1USD = 6.152RMB

Social security and welfare program
(Myanmar Employees)

No.	Item	Criterion	Description	Remarks
1	Basic social insurance	According to the laws of the government	According current laws and regulations of Myanmar	
2	Dining allowance	Free meals at present; settled at the end of the year based on the expenses conditions	Itemized as the welfare expenses	
3	Medical expenses	Infirmary built for emergency treatment at the site	Itemized as the welfare expenses	
4	Transport allowance	According to the company policy	Itemized as the wage	
5	Communication allowance	According to the company policy	Itemized as the wage	
6	Physical examination fee	Reimbursed by actual amounts incurred		
7	Travel allowance	According to the company policy		
8	Leave	According to the company policy and the laws of the government	According current laws and regulations of Myanmar	
9	Others	Provide training and labor protection appliances as per the job requirements		

Financial analysis on Chipwi Nge HPP

Basic data:			Amount	Unit
Fixed data	1	Total installed capacity	99	MW
	2	Yearly Generating Energy	0.599	TW.h
	3	Ratio of self consumption & power loss	4.6%	
	4	Taxes		
		Commercial Tax	5%	
		Income taxes	25%	
		Withholding Taxes	15%	
	5	Interest rate of loan	7.71%	6.55%
	6	Depreciation Rate	4%	
	7	Total Investment	1,491.17	MnRMB
	8	Equity Capital (30%)	447.35	MnRMB
	9	Bank loan (70%)	1,043.82	MnRMB
	10	Trial operation energy tariff	0.375	RMB/KW.h
	11	Energy tariff	0.375	RMB/KW.h
	12	Operation period	40	Year
	13	Loan Payback period	29	Year
Variables	1	Energy under DHPP (royalty fee)	0%	
	2	Free share to DHPP	15%	
Result	1	Internal rate of return (IRR)	8.05%	
Operation period	1	Energy under DHPP (royalty fee)	-	TW.h
	2	Energy to be sold by investor	24.0	TW.h
	3	Investor sales income	8,797.59	MnRMB
	4	Total Interest	1,279.16	MnRMB
	5	Total Operation/maintenance Fee	1,650.04	MnRMB
	6	Total Net Profit	3,002.06	MnRMB
DHPP/ Taxes Net Income				
Without considering time value	1	Total Energy Sales under DHPP (royalty fee)	-	MnRMB
	2	Total Withholding Taxes	155.42	MnRMB
	3	Total Commercial Taxes	396.25	MnRMB
	4	Total Income Taxes	978.91	MnRMB
	5	Out of free share	430.90	MnRMB
		Total	1,961.49	MnRMB
With considering time	1	Total Energy Sales under DHPP (royalty fee)	-	MnRMB
	2	Total Withholding Taxes	30.77	MnRMB

Financial analysis on Chipwi Nge HPP

Basic data:			Amount	Unit
value(ic=10%)	3	Total Commercial Taxes	30.11	MnRMB
	4	Total Income Taxes	44.66	MnRMB
	5	Out of free share	21.20	MnRMB
		Total	126.74	
Investor net income	**Without considering time value:**			
	1	Sharing Net Profit	2,441.75	MnRMB
	With considering time value(Ic=10%):			
	1	Sharing Net Profit	120.11	MnRMB
Investment recovery period			16.14	Years
Remark				

Financial analysis on Chipwi Nge HPP

Basic data:			Amount	Unit
Fixed data	1	Total installed capacity	99	MW
	2	Yearly Generating Energy	0.599	TW.h
	3	Ratio of self consumption & power loss	4.6%	
	4	Taxes		
		Commercial Tax	5%	
		Income taxes	25%	
		Withholding Taxes	15%	
	5	Interest rate of loan	7.71%	6.55%
	6	Depreciation Rate	4%	
	7	Total Investment	242.39	MnUSD
	8	Equity Capital (30%)	72.72	MnUSD
	9	Bank loan (70%)	169.67	MnUSD
	10	Trial operation energy tariff	0.061	USD/KW.h
	11	Energy tariff	0.061	USD/KW.h
	12	Operation period	40	Year
	13	Loan Payback period	29	Year
Variables	1	Energy under DHPP (royalty fee)	0%	
	2	Free share to DHPP	15%	
Result	1	Internal rate of return (IRR)	8.05%	
Operation period	1	Energy under DHPP (royalty fee)	-	TW.h
	2	Energy to be sold by investor	24.0	TW.h
	3	Investor sales income	1,430.04	MnUSD
	4	Total Interest	207.93	MnUSD
	5	Total Operation/maintenance Fee	268.21	MnUSD
	6	Total Net Profit	487.98	MnUSD
DHPP/ Taxes Net Income				
Without considering time value	1	Total Energy Sales under DHPP (royalty fee)	-	MnUSD
	2	Total Withholding Taxes	25.26	MnUSD
	3	Total Commercial Taxes	64.41	MnUSD
	4	Total Income Taxes	159.12	MnUSD
	5	Out of free share	70.04	MnUSD
		Total	318.84	MnUSD
With considering time	1	Total Energy Sales under DHPP (royalty fee)	-	MnUSD
	2	Total Withholding Taxes	5.00	MnUSD

Financial analysis on Chipwi Nge HPP

Basic data:			Amount	Unit
value(ic=10%)	3	Total Commercial Taxes	4.89	MnUSD
	4	Total Income Taxes	7.26	MnUSD
	5	Out of free share	3.45	MnUSD
		Total	20.60	
Investor net income	**Without considering time value:**			
	1	Sharing Net Profit	396.90	MnUSD
	With considering time value(Ic=10%):			
	1	Sharing Net Profit	19.52	MnUSD
Investment recovery period			16.14	Years
Remark	Ratio: 1USD = 6.152 RMB			

Table 1 Investment Program and Raising Money

Sr no	Year	2008	2009	2010	2011	2012.3.31	2012	2013	2014.3.31		2014	2015	2016	2017		Unit
										sub-total					total	
1.1	Total investment															
1.1.1	Fixed asset investment	3344	8918	9167	26320	63730	0	4627	397	116504			2100		118604	10^4RMB
		544	1450	1490	4278	10359	0	752	65	18938			341		19279	10^4 USD
1.1.2	Total	3420	9276	9952	27946	66957	3259	10217	1899	132927	137714	143758	148826	149117	149117	10^4RMB
		556	1508	1618	4543	10884	530	1661	309	21607	22385	23368	24192	24239	24239	10^4 USD
1.2	Financing															
1.2.1	Equity	1026	2783	2985	8384	13256	7809	3065	570	39878	1436	1813	1521	87	44735	10^4RMB
		167	452	485	1363	2155	1269	498	93	6482	233	295	247	14	7272	10^4 USD
1.2.2	Long-term loan	2394	6493	6966	19562	30931	18221	7152	1329	93049	3351	4231	3548	203	104382	10^4RMB
		389	1055	1132	3180	5028	2962	1163	216	15125	545	688	577	33	16967	10^4 USD

Table 2 Total cost Estimate

Sr no	Year	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Unit
2.1	Depreciation											10^4RMB
												10^4 USD
2.2	Insurance (Property All Risk)							399	532	532	532	10^4RMB
								65	86	86	86	10^4 USD
2.3	Interest Payable							4571	6314	6591	6824	10^4RMB
								743	1026	1071	1109	10^4 USD
2.4	Repair fee							828	1048	1158	1708	10^4RMB
								135	170	188	278	10^4 USD
2.5	Overheads							1214	1611	1611	1611	10^4RMB
								197	262	262	262	10^4 USD
2.6	Other Expenses(CSR)											10^4RMB
												10^4 USD
	Total Cost							7012	9505	9892	10674	10^4RMB
								1140	1545	1608	1735	10^4 USD
	Operating Expenses (Ex Depr + Interest)							2441	3191	3300	3851	10^4RMB
								397	519	536	626	10^4 USD

Table 2 Total cost Estimate

Sr no	Year	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	Unit
		1	2	3	4	5	6	7	8	9	10	
2.1	Depreciation	5965	5965	5965	5965	5965	5965	5965	5965	5965	5965	10^4RMB
		970	970	970	970	970	970	970	970	970	970	10^4 USD
2.2	Insurance (Property All Risk)	532	508	484	460	436	412	389	365	341	317	10^4RMB
		86	83	79	75	71	67	63	59	55	52	10^4 USD
2.3	Interest Payable	8044	7862	7666	7456	7229	6985	6721	6438	6133	5804	10^4RMB
		1307	1278	1246	1212	1175	1135	1093	1046	997	943	10^4 USD
2.4	Repair fee	828	1048	1158	1708	828	1048	1158	1708	828	1048	10^4RMB
		135	170	188	278	135	170	188	278	135	170	10^4 USD
2.5	Overheads	1611	1611	1611	1611	1611	1611	1611	1611	1611	1611	10^4RMB
		262	262	262	262	262	262	262	262	262	262	10^4 USD
2.6	Other Expenses(CSR)	44	44	45	31	42	43	45	42	54	55	10^4RMB
		7	7	7	5	7	7	7	7	9	9	10^4 USD
	Total Cost	17023	17038	16929	17231	16111	16064	15888	16128	14931	14800	10^4RMB
		2767	2769	2752	2801	2619	2611	2583	2622	2427	2406	10^4 USD
	Operating Expenses (Ex Depr + Interest)	3015	3211	3298	3810	2918	3115	3202	3726	2834	3032	10^4RMB
		490	522	536	619	474	506	520	606	461	493	10^4 USD

Table 2 Total cost Estimate

Sr no	Year	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	Unit
		11	12	13	14	15	16	17	18	19	20	
2.1	Depreciation	5965	5965	5965	5965	5965	5965	5965	5965	5965	5965	10^4RMB
		970	970	970	970	970	970	970	970	970	970	10^4 USD
2.2	Insurance (Property All Risk)	293	269	245	222	198	174	150	126	102	78	10^4RMB
		48	44	40	36	32	28	24	20	17	13	10^4 USD
2.3	Interest Payable	5450	5068	4657	4215	3738	3225	2672	2076	1435	744	10^4RMB
		886	824	757	685	608	524	434	338	233	121	10^4 USD
2.4	Repair fee	1158	1708	828	1048	1158	1708	828	1048	1158	1708	10^4RMB
		188	278	135	170	188	278	135	170	188	278	10^4 USD
2.5	Overheads	1611	1611	1611	1611	1611	1611	1611	1611	1611	1611	10^4RMB
		262	262	262	262	262	262	262	262	262	262	10^4 USD
2.6	Other Expenses(CSR)	58	57	70	72	76	76	90	94	100	101	10^4RMB
		9	9	11	12	12	12	15	15	16	16	10^4 USD
	Total Cost	14534	14678	13376	13132	12745	12758	11316	10921	10370	10207	10^4RMB
		2363	2386	2174	2135	2072	2074	1839	1775	1686	1659	10^4 USD
	Operating Expenses (Ex Depr + Interest)	3120	3645	2754	2953	3042	3569	2679	2880	2971	3499	10^4RMB
		507	592	448	480	495	580	435	468	483	569	10^4 USD

Table 2 Total cost Estimate

Sr no	Year	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	Unit
		21	22	23	24	25	26	27	28	29	30	
2.1	Depreciation	5965	5965	5965	5965	5965	0					10^4RMB
		970	970	970	970	970	0					10^4 USD
2.2	Insurance (Property All Risk)	55	31	7	0							10^4RMB
		9	5	1	0							10^4 USD
2.3	Interest Payable	0										10^4RMB
		0										10^4 USD
2.4	Repair fee	828	1048	1158	1708	828	1048	3697	3037	3697	3037	10^4RMB
		135	170	188	278	135	170	601	494	601	494	10^4 USD
2.5	Overheads	1611	1611	1611	1611	1611	1611	1611	1611	1611	1611	10^4RMB
		262	262	262	262	262	262	262	262	262	262	10^4 USD
2.6	Other Expenses(CSR)	118	116	115	110	118	175	149	155	149	155	10^4RMB
		19	19	19	18	19	28	24	25	24	25	10^4 USD
	Total Cost	8576	8770	8855	9393	8522	2834	5457	4804	5457	4804	10^4RMB
		1394	1426	1439	1527	1385	461	887	781	887	781	10^4 USD
	Operating Expenses (Ex Depr + Interest)	2611	2806	2890	3429	2557	2834	5457	4804	5457	4804	10^4RMB
		424	456	470	557	416	461	887	781	887	781	10^4 USD

Table 2 Total cost Estimate

Sr no	Year	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	Unit
		31	32	33	34	35	36	37	38	39	40	
2.1	Depreciation											10^4RMB
												10^4 USD
2.2	Insurance (Property All Risk)											10^4RMB
												10^4 USD
2.3	Interest Payable											10^4RMB
												10^4 USD
2.4	Repair fee	3697	3037	3697	3037	3697	3037	3697	3037	3697	3037	10^4RMB
		601	494	601	494	601	494	601	494	601	494	10^4 USD
2.5	Overheads	1611	1611	1611	1611	1611	1611	1611	1611	1611	1611	10^4RMB
		262	262	262	262	262	262	262	262	262	262	10^4 USD
2.6	Other Expenses(CSR)	149	155	149	155	149	155	149	155	149	155	10^4RMB
		24	25	24	25	24	25	24	25	24	25	10^4 USD
	Total Cost	5457	4804	5457	4804	5457	4804	5457	4804	5457	4804	10^4RMB
		887	781	887	781	887	781	887	781	887	781	10^4 USD
	Operating Expenses (Ex Depr + Interest)	5457	4804	5457	4804	5457	4804	5457	4804	5457	4804	10^4RMB
		887	781	887	781	887	781	887	781	887	781	10^4 USD

Table 3 Profit and Loss Statement

Sr no	Year	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Unit
	Grid Tariff (RMB/KWH)	0.375										
3.1	Sales Income							2224	3461	6923	10384	10^4RMB
								362	563	1125	1688	10^4 USD
3.2	Total Cost							7012	9505	9892	10674	10^4RMB
								1140	1545	1608	1735	10^4 USD
3.3	Commercial Tax on Export Sales							-	-	-	-	10^4RMB
								-	-	-	-	10^4 USD
3.4	Profit Before Income Tax							-4787	-6044	-2969	-290	10^4RMB
								-778	-982	-483	-47	10^4 USD
3.5	Income tax							-	-	-	-	10^4RMB
								-	-	-	-	10^4 USD
3.6	Net Profit							-4787	-6044	-2969	-290	10^4RMB
								-778	-982	-483	-47	10^4 USD
3.7	Retained Earning							-4787	-6044	-2969	-290	10^4RMB
								-778	-982	-483	-47	10^4 USD
3.8	Profit Payable							-	-	-	-	10^4RMB
								-	-	-	-	10^4 USD
3.9	DHPP							-	-	-	-	10^4RMB
								-	-	-	-	10^4 USD
3.10	Investors							-	-	-	-	10^4RMB
								-	-	-	-	10^4 USD

Table 3 Profit and Loss Statement

Sr no	Year	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	Unit
		1	2	3	4	5	6	7	8	9	10	
	Grid Tariff (RMB/KWH)	0.375										
3.1	Sales Income	21419	21419	21419	21419	21419	21419	21419	21419	21419	21419	10^4RMB
		3482	3482	3482	3482	3482	3482	3482	3482	3482	3482	10^4 USD
3.2	Total Cost	17023	17038	16929	17231	16111	16064	15888	16128	14931	14800	10^4RMB
		2767	2769	2752	2801	2619	2611	2583	2622	2427	2406	10^4 USD
3.3	Commercial Tax on Export Sales	-	-	-	1071	1071	1071	1071	1071	1071	1071	10^4RMB
		-	-	-	174	174	174	174	174	174	174	10^4 USD
3.4	Profit Before Income Tax	4396	4382	4491	3118	4237	4284	4460	4220	5417	5548	10^4RMB
		715	712	730	507	689	696	725	686	881	902	10^4 USD
3.5	Income tax	-	-	-	-	-	1071	1115	1055	1354	1387	10^4RMB
		-	-	-	-	-	174	181	171	220	225	10^4 USD
3.6	Net Profit	4396	4382	4491	3118	4237	3213	3345	3165	4063	4161	10^4RMB
		715	712	730	507	689	522	544	514	660	676	10^4 USD
3.7	Retained Earning	0	0	0	2296	4237	3213	3345	3165	4063	4161	10^4RMB
		0	0	0	373	689	522	544	514	660	676	10^4 USD
3.8	Profit Payable	-	-	-	2296	4237	3213	3345	3165	4063	4161	10^4RMB
		-	-	-	373	689	522	544	514	660	676	10^4 USD
3.9	DHPP	-	-	-	344	636	482	502	475	609	624	10^4RMB
		-	-	-	56	103	78	82	77	99	101	10^4 USD
3.10	Investors	-	-	-	1952	3602	2731	2843	2690	3453	3537	10^4RMB
		-	-	-	317	585	444	462	437	561	575	10^4 USD

Table 3 Profit and Loss Statement

Sr no	Year	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	Unit
		11	12	13	14	15	16	17	18	19	20	
	Grid Tariff (RMB/KWH)	0.375										
3.1	Sales Income	21419	21419	21419	21419	21419	21419	21419	21419	21419	21419	10^4RMB
		3482	3482	3482	3482	3482	3482	3482	3482	3482	3482	10^4 USD
3.2	Total Cost	14534	14678	13376	13132	12745	12758	11316	10921	10370	10207	10^4RMB
		2363	2386	2174	2135	2072	2074	1839	1775	1686	1659	10^4 USD
3.3	Commercial Tax on Export Sales	1071	1071	1071	1071	1071	1071	1071	1071	1071	1071	10^4RMB
		174	174	174	174	174	174	174	174	174	174	10^4 USD
3.4	Profit Before Income Tax	5814	5671	6972	7216	7603	7590	9033	9428	9978	10141	10^4RMB
		945	922	1133	1173	1236	1234	1468	1532	1622	1648	10^4 USD
3.5	Income tax	1454	1418	1743	1804	1901	1898	2258	2357	2494	2535	10^4RMB
		236	230	283	293	309	308	367	383	405	412	10^4 USD
3.6	Net Profit	4361	4253	5229	5412	5702	5693	6774	7071	7483	7606	10^4RMB
		709	691	850	880	927	925	1101	1149	1216	1236	10^4 USD
3.7	Retained Earning	4361	4253	5229	5412	5702	5693	6774	7071	7483	7606	10^4RMB
		709	691	850	880	927	925	1101	1149	1216	1236	10^4 USD
3.8	Profit Payable	4361	4253	5229	5191	5005	4482	5011	4712	4483	3914	10^4RMB
		709	691	850	844	814	729	815	766	729	636	10^4 USD
3.9	DHPP	654	638	784	779	751	672	752	707	672	587	10^4RMB
		106	104	128	127	122	109	122	115	109	95	10^4 USD
3.10	Investors	3706	3615	4445	4413	4254	3810	4259	4005	3811	3327	10^4RMB
		602	588	723	717	692	619	692	651	619	541	10^4 USD

Table 3 Profit and Loss Statement

Sr no	Year	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	Unit
		21	22	23	24	25	26	27	28	29	30	
	Grid Tariff (RMB/KWH)	0.375										
3.1	Sales Income	21419	21419	21419	21419	21419	21419	21419	21419	21419	21419	10^4RMB
		3482	3482	3482	3482	3482	3482	3482	3482	3482	3482	10^4 USD
3.2	Total Cost	8576	8770	8855	9393	8522	2834	5457	4804	5457	4804	10^4RMB
		1394	1426	1439	1527	1385	461	887	781	887	781	10^4 USD
3.3	Commercial Tax on Export Sales	1071	1071	1071	1071	1071	1071	1071	1071	1071	1071	10^4RMB
		174	174	174	174	174	174	174	174	174	174	10^4 USD
3.4	Profit Before Income Tax	11772	11578	11493	10955	11826	17514	14891	15544	14891	15544	10^4RMB
		1914	1882	1868	1781	1922	2847	2421	2527	2421	2527	10^4 USD
3.5	Income tax	2943	2894	2873	2739	2957	4378	3723	3886	3723	3886	10^4RMB
		478	470	467	445	481	712	605	632	605	632	10^4 USD
3.6	Net Profit	8829	8683	8620	8216	8870	13135	11169	11658	11169	11658	10^4RMB
		1435	1411	1401	1336	1442	2135	1815	1895	1815	1895	10^4 USD
3.7	Retained Earning	8829	8683	8620	8216	8870	13135	11169	11658	11169	11658	10^4RMB
		1435	1411	1401	1336	1442	2135	1815	1895	1815	1895	10^4 USD
3.8	Profit Payable	8829	8683	8620	8216	8870	13135	11169	11658	11169	11658	10^4RMB
		1435	1411	1401	1336	1442	2135	1815	1895	1815	1895	10^4 USD
3.9	DHPP	1324	1302	1293	1232	1330	1970	1675	1749	1675	1749	10^4RMB
		215	212	210	200	216	320	272	284	272	284	10^4 USD
3.10	Investors	7505	7381	7327	6984	7539	11165	9493	9910	9493	9910	10^4RMB
		1220	1200	1191	1135	1226	1815	1543	1611	1543	1611	10^4 USD

Table 3 Profit and Loss Statement

Sr no	Year	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	Unit
		31	32	33	34	35	36	37	38	39	40	
	Grid Tariff (RMB/KWH)	0.375										
3.1	Sales Income	21419	21419	21419	21419	21419	21419	21419	21419	21419	21419	10^4RMB
		3482	3482	3482	3482	3482	3482	3482	3482	3482	3482	10^4 USD
3.2	Total Cost	5457	4804	5457	4804	5457	4804	5457	4804	5457	4804	10^4RMB
		887	781	887	781	887	781	887	781	887	781	10^4 USD
3.3	Commercial Tax on Export Sales	1071	1071	1071	1071	1071	1071	1071	1071	1071	1071	10^4RMB
		174	174	174	174	174	174	174	174	174	174	10^4 USD
3.4	Profit Before Income Tax	14891	15544	14891	15544	14891	15544	14891	15544	14891	15544	10^4RMB
		2421	2527	2421	2527	2421	2527	2421	2527	2421	2527	10^4 USD
3.5	Income tax	3723	3886	3723	3886	3723	3886	3723	3886	3723	3886	10^4RMB
		605	632	605	632	605	632	605	632	605	632	10^4 USD
3.6	Net Profit	11169	11658	11169	11658	11169	11658	11169	11658	11169	11658	10^4RMB
		1815	1895	1815	1895	1815	1895	1815	1895	1815	1895	10^4 USD
3.7	Retained Earning	11169	11658	11169	11658	11169	11658	11169	11658	11169	11658	10^4RMB
		1815	1895	1815	1895	1815	1895	1815	1895	1815	1895	10^4 USD
3.8	Profit Payable	11169	11658	11169	11658	11169	11658	11169	11658	11169	11658	10^4RMB
		1815	1895	1815	1895	1815	1895	1815	1895	1815	1895	10^4 USD
3.9	DHPP	1675	1749	1675	1749	1675	1749	1675	1749	1675	1749	10^4RMB
		272	284	272	284	272	284	272	284	272	284	10^4 USD
3.10	Investors	9493	9910	9493	9910	9493	9910	9493	9910	9493	9910	10^4RMB
		1543	1611	1543	1611	1543	1611	1543	1611	1543	1611	10^4 USD

Table 4 Repayment of Loan and Interest

Sr no	Year	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Unit
4.1	Loan repayment with interest											
4.1.1	Long term loan	2394	8888	15854	35416	84567	91719	96400	100630	104178	104382	10^4RMB
		389	1445	2577	5757	13746	14909	15670	16357	16934	16967	10^4 USD
4.1.2	Interest	76	358	785	1626	6486	7092	4571	6314	6591	6824	10^4RMB
		12	58	128	264	1054	1153	743	1026	1071	1109	10^4 USD
4.1.3	Loan and interest repayable							216	-270	-3622	-6534	10^4RMB
								35	-44	-589	-1062	10^4 USD
4.2	Fund source for repayment							-	-	-	-	10^4RMB
								-	-	-	-	10^4 USD
4.2.1	Net profit							-4787	-6044	-2969	-290	10^4RMB
								-778	-982	-483	-47	10^4 USD
4.2.2	Depreciation							-	-	-	-	10^4RMB
								-	-	-	-	10^4 USD
4.2.3	Interest Expenses							4571	6314	6591	6824	10^4RMB
								743	1026	1071	1109	10^4 USD
4.3	Total							-216	270	3622	6534	10^4RMB
								-35	44	589	1062	10^4 USD

Table 4 Repayment of Loan and Interest

Sr no	Year	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	Unit
		1	2	3	4	5	6	7	8	9	10	
4.1	Loan repayment with interest											
4.1.1	Long term loan	102025	99487	96754	93810	90639	87223	83545	79583	75315	70719	10^4RMB
		16584	16172	15727	15249	14733	14178	13580	12936	12242	11495	10^4 USD
4.1.2	Interest	8044	7862	7666	7456	7229	6985	6721	6438	6133	5804	10^4RMB
		1307	1278	1246	1212	1175	1135	1093	1046	997	943	10^4 USD
4.1.3	Loan and interest repayable	-10400	-10400	-10400	-10400	-10400	-10400	-10400	-10400	-10400	-10400	10^4RMB
		-1690	-1690	-1690	-1690	-1690	-1690	-1690	-1690	-1690	-1690	10^4 USD
4.2	Fund source for repayment	2356	2538	2733	2944	3171	3415	3679	3962	4267	4596	10^4RMB
		383	413	444	479	515	555	598	644	694	747	10^4 USD
4.2.1	Net profit	4396	4382	4491	3118	4237	3213	3345	3165	4063	4161	10^4RMB
		715	712	730	507	689	522	544	514	660	676	10^4 USD
4.2.2	Depreciation	5965	5965	5965	5965	5965	5965	5965	5965	5965	5965	10^4RMB
		970	970	970	970	970	970	970	970	970	970	10^4 USD
4.2.3	Interest Expenses	8044	7862	7666	7456	7229	6985	6721	6438	6133	5804	10^4RMB
		1307	1278	1246	1212	1175	1135	1093	1046	997	943	10^4 USD
4.3	Total	18405	18208	18122	16538	17431	16162	16031	15567	16160	15929	10^4RMB
		2992	2960	2946	2688	2833	2627	2606	2530	2627	2589	10^4 USD

Table 4 Repayment of Loan and Interest

Sr no	Year	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	Unit
		11	12	13	14	15	16	17	18	19	20	
4.1	Loan repayment with interest											
4.1.1	Long term loan	65769	60437	54695	48509	41848	34672	26944	18621	9656	0	10^4RMB
		10691	9824	8891	7885	6802	5636	4380	3027	1570	0	10^4 USD
4.1.2	Interest	5450	5068	4657	4215	3738	3225	2672	2076	1435	744	10^4RMB
		886	824	757	685	608	524	434	338	233	121	10^4 USD
4.1.3	Loan and interest repayable	-10400	-10400	-10400	-10400	-10400	-10400	-10400	-10400	-10400	-10400	10^4RMB
		-1690	-1690	-1690	-1690	-1690	-1690	-1690	-1690	-1690	-1690	10^4 USD
4.2	Fund source for repayment	4950	5332	5743	6185	6662	7175	7728	8324	8965	9656	10^4RMB
		805	867	933	1005	1083	1166	1256	1353	1457	1570	10^4 USD
4.2.1	Net profit	4361	4253	5229	5412	5702	5693	6774	7071	7483	7606	10^4RMB
		709	691	850	880	927	925	1101	1149	1216	1236	10^4 USD
4.2.2	Depreciation	5965	5965	5965	5965	5965	5965	5965	5965	5965	5965	10^4RMB
		970	970	970	970	970	970	970	970	970	970	10^4 USD
4.2.3	Interest Expenses	5450	5068	4657	4215	3738	3225	2672	2076	1435	744	10^4RMB
		886	824	757	685	608	524	434	338	233	121	10^4 USD
4.3	Total	15775	15286	15851	15591	15405	14882	15411	15112	14883	14314	10^4RMB
		2564	2485	2577	2534	2504	2419	2505	2456	2419	2327	10^4 USD

Table 5 Cash flow (of the equity)

Sr no	Year	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Unit
5.1	Cash inflow							2224	3461	6923	10384	10^4RMB
								362	563	1125	1688	10^4 USD
5.1.1	Income Revenue							2224	3461	6923	10384	10^4RMB
								362	563	1125	1688	10^4 USD
5.1.2	Reclaim of Current Funds											10^4RMB
												10^4 USD
5.1.3	AW - Repayement of equity interest in JV											10^4RMB
												10^4 USD
5.2	Cash Outflow	-1026	-2783	-2985	-8384	-21065	-3065	-7581	-9505	-10522	-10674	10^4RMB
		-167	-452	-485	-1363	-3424	-498	-1232	-1545	-1710	-1735	10^4 USD
5.2.1	Equity Capital	-1026	-2783	-2985	-8384	-21065	-3065	-570		-630		10^4RMB
		-167	-452	-485	-1363	-3424	-498	-93		-102		10^4 USD
5.2.2	Repayment of Term Loan							-4571	-6314	-6591	-6824	10^4RMB
								-743	-1026	-1071	-1109	10^4 USD
5.2.3	Operating Expenses							-2441	-3191	-3300	-3851	10^4RMB
								-397	-519	-536	-626	10^4 USD
5.2.4	DHPI - Commercial Tax											10^4RMB
												10^4 USD
5.2.5	DHPI - Income Tax											10^4RMB
												10^4 USD
5.2.6	DHPI share of Net											10^4RMB

	Profit											10^4 USD
5.2.7	Loan repayable											10^4RMB
												10^4 USD
5.3	Net Cash Flow	-1026	-2783	-2985	-8384	-21065	-3065	-5357	-6044	-3599	-290	10^4RMB
		-167	-452	-485	-1363	-3424	-498	-871	-982	-585	-47	10^4 USD
	Accumulated Net Cash Flow	-1026	-2783	-2985	-8384	-21065	-24130	-29487	-35531	-39130	-39420	10^4RMB
		-167	-452	-485	-1363	-3424	-3922	-4793	-5775	-6360	-6408	10^4 USD

Table 5 Cash flow (of the equity)

Sr no	Year	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	Unit
		1	2	3	4	5	6	7	8	9	10	
5.1	Cash inflow	21419	21419	21419	21419	21419	21419	21419	21419	21419	21419	10^4RMB
		3482	3482	3482	3482	3482	3482	3482	3482	3482	3482	10^4 USD
5.1.1	Income Revenue	21419	21419	21419	21419	21419	21419	21419	21419	21419	21419	10^4RMB
		3482	3482	3482	3482	3482	3482	3482	3482	3482	3482	10^4 USD
5.1.2	Reclaim of Current Funds											10^4RMB
												10^4 USD
5.1.3	AW - Repayement of equity interest in JV											10^4RMB
												10^4 USD
5.2	Cash Outflow	-13414	-13611	-13697	-15625	-15024	-16139	-16290	-16726	-16268	-16514	10^4RMB
		-2180	-2212	-2227	-2540	-2442	-2623	-2648	-2719	-2644	-2684	10^4 USD
5.2.1	Equity Capital											10^4RMB
												10^4 USD
5.2.2	Repayment of Term Loan	-8044	-7862	-7666	-7456	-7229	-6985	-6721	-6438	-6133	-5804	10^4RMB
		-1307	-1278	-1246	-1212	-1175	-1135	-1093	-1046	-997	-943	10^4 USD
5.2.3	Operating Expenses	-3015	-3211	-3298	-3810	-2918	-3115	-3202	-3726	-2834	-3032	10^4RMB
		-490	-522	-536	-619	-474	-506	-520	-606	-461	-493	10^4 USD
5.2.4	DHPI - Commercial Tax				-1071	-1071	-1071	-1071	-1071	-1071	-1071	10^4RMB
					-174	-174	-174	-174	-174	-174	-174	10^4 USD
5.2.5	DHPI - Income Tax						-1071	-1115	-1055	-1354	-1387	10^4RMB
							-174	-181	-171	-220	-225	10^4 USD
5.2.6	DHPI share of Net				-344	-636	-482	-502	-475	-609	-624	10^4RMB

	Profit				-56	-103	-78	-82	-77	-99	-101	10^4 USD
5.2.7	Loan repayable	-2356	-2538	-2733	-2944	-3171	-3415	-3679	-3962	-4267	-4596	10^4RMB
		-383	-413	-444	-479	-515	-555	-598	-644	-694	-747	10^4 USD
5.3	Net Cash Flow	8005	7808	7722	5794	6395	5281	5130	4693	5151	4905	10^4RMB
		1301	1269	1255	942	1040	858	834	763	837	797	10^4 USD
	Accumulated Net Cash Flow	-31415	-23607	-15885	-10091	-3696	1585	6714	11407	16558	21463	10^4RMB
		-5106	-3837	-2582	-1640	-601	258	1091	1854	2691	3489	10^4 USD

Table 5 Cash flow (of the equity)

Sr no	Year	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	Unit
		11	12	13	14	15	16	17	18	19	20	
5.1	Cash inflow	21419	21419	21419	21419	21419	21419	21419	21419	21419	21419	10^4RMB
		3482	3482	3482	3482	3482	3482	3482	3482	3482	3482	10^4 USD
5.1.1	Income Revenue	21419	21419	21419	21419	21419	21419	21419	21419	21419	21419	10^4RMB
		3482	3482	3482	3482	3482	3482	3482	3482	3482	3482	10^4 USD
5.1.2	Reclaim of Current Funds											10^4RMB
												10^4 USD
5.1.3	AW - Repayement of equity interest in JV											10^4RMB
												10^4 USD
5.2	Cash Outflow	-16698	-17171	-16752	-17007	-17165	-17609	-17160	-17414	-17608	-18092	10^4RMB
		-2714	-2791	-2723	-2764	-2790	-2862	-2789	-2831	-2862	-2941	10^4 USD
5.2.1	Equity Capital											10^4RMB
												10^4 USD
5.2.2	Repayment of Term Loan	-5450	-5068	-4657	-4215	-3738	-3225	-2672	-2076	-1435	-744	10^4RMB
		-886	-824	-757	-685	-608	-524	-434	-338	-233	-121	10^4 USD
5.2.3	Operating Expenses	-3120	-3645	-2754	-2953	-3042	-3569	-2679	-2880	-2971	-3499	10^4RMB
		-507	-592	-448	-480	-495	-580	-435	-468	-483	-569	10^4 USD
5.2.4	DHPI - Commercial Tax	-1071	-1071	-1071	-1071	-1071	-1071	-1071	-1071	-1071	-1071	10^4RMB
		-174	-174	-174	-174	-174	-174	-174	-174	-174	-174	10^4 USD
5.2.5	DHPI - Income Tax	-1454	-1418	-1743	-1804	-1901	-1898	-2258	-2357	-2494	-2535	10^4RMB
		-236	-230	-283	-293	-309	-308	-367	-383	-405	-412	10^4 USD
5.2.6	DHPI share of Net	-654	-638	-784	-779	-751	-672	-752	-707	-672	-587	10^4RMB

	Profit	-106	-104	-128	-127	-122	-109	-122	-115	-109	-95	10^4 USD
5.2.7	Loan repayable	-4950	-5332	-5743	-6185	-6662	-7175	-7728	-8324	-8965	-9656	10^4RMB
		-805	-867	-933	-1005	-1083	-1166	-1256	-1353	-1457	-1570	10^4 USD
5.3	Net Cash Flow	4721	4248	4667	4413	4254	3810	4259	4005	3811	3327	10^4RMB
		767	690	759	717	692	619	692	651	619	541	10^4 USD
	Accumulated Net Cash Flow	26184	30432	35099	39511	43766	47575	51835	55840	59650	62978	10^4RMB
		4256	4947	5705	6423	7114	7733	8426	9077	9696	10237	10^4 USD

Table 5 Cash flow (of the equity)

Sr no	Year	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	Unit
		21	22	23	24	25	26	27	28	29	30	
5.1	Cash inflow	21419	21419	21419	21419	21419	21419	21419	21419	21419	21419	
		3482	3482	3482	3482	3482	3482	3482	3482	3482	3482	
5.1.1	Income Revenue	21419	21419	21419	21419	21419	21419	21419	21419	21419	21419	104RMB
		3482	3482	3482	3482	3482	3482	3482	3482	3482	3482	104 USD
5.1.2	Reclaim of Current Funds											104RMB
												104 USD
5.1.3	AW - Repayement of equity interest in JV											104RMB
												104 USD
5.2	Cash Outflow	-7950	-8074	-8128	-8471	-7915	-10254	-11926	-11510	-11926	-11510	104RMB
		-1292	-1312	-1321	-1377	-1287	-1667	-1939	-1871	-1939	-1871	104 USD
5.2.1	Equity Capital											10^4RMB
												10^4 USD
5.2.2	Repayment of Term Loan											10^4RMB
												10^4 USD
5.2.3	Operating Expenses	-2611	-2806	-2890	-3429	-2557	-2834	-5457	-4804	-5457	-4804	10^4RMB
		-424	-456	-470	-557	-416	-461	-887	-781	-887	-781	10^4 USD
5.2.4	DHPI - Commercial Tax	-1071	-1071	-1071	-1071	-1071	-1071	-1071	-1071	-1071	-1071	10^4RMB
		-174	-174	-174	-174	-174	-174	-174	-174	-174	-174	10^4 USD
5.2.5	DHPI - Income Tax	-2943	-2894	-2873	-2739	-2957	-4378	-3723	-3886	-3723	-3886	10^4RMB
		-478	-470	-467	-445	-481	-712	-605	-632	-605	-632	10^4 USD
5.2.6	DHPI share of Net	-1324	-1302	-1293	-1232	-1330	-1970	-1675	-1749	-1675	-1749	10^4RMB

	Profit	-215	-212	-210	-200	-216	-320	-272	-284	-272	-284	10^4 USD
5.2.7	Loan repayable											10^4RMB
												10^4 USD
5.3	Net Cash Flow	13470	13345	13292	12949	13504	11165	9493	9910	9493	9910	10^4RMB
		2189	2169	2161	2105	2195	1815	1543	1611	1543	1611	10^4 USD
	Accumulated Net Cash Flow	76447	89793	103084	116033	129537	140702	150195	160105	169598	179508	10^4RMB
		12426	14596	16756	18861	21056	22871	24414	26025	27568	29179	10^4 USD

Table 5 Cash flow (of the equity)

Sr no	Year	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	Unit
		31	32	33	34	35	36	37	38	39	40	
5.1	Cash inflow	21419	21419	21419	21419	21419	21419	21419	21419	21419	21419	
		3482	3482	3482	3482	3482	3482	3482	3482	3482	3482	
5.1.1	Income Revenue	21419	21419	21419	21419	21419	21419	21419	21419	21419	21419	10^4RMB
		3482	3482	3482	3482	3482	3482	3482	3482	3482	3482	10^4 USD
5.1.2	Reclaim of Current Funds											10^4RMB
												10^4 USD
5.1.3	AW - Repayement of equity interest in JV											10^4RMB
												10^4 USD
5.2	Cash Outflow	-11926	-11510	-11926	-11510	-11926	-11510	-11926	-11510	-11926	-11510	10^4RMB
		-1939	-1871	-1939	-1871	-1939	-1871	-1939	-1871	-1939	-1871	10^4 USD
5.2.1	Equity Capital											10^4RMB
												10^4 USD
5.2.2	Repayment of Term Loan											10^4RMB
												10^4 USD
5.2.3	Operating Expenses	-5457	-4804	-5457	-4804	-5457	-4804	-5457	-4804	-5457	-4804	10^4RMB
		-887	-781	-887	-781	-887	-781	-887	-781	-887	-781	10^4 USD
5.2.4	DHPI - Commercial Tax	-1071	-1071	-1071	-1071	-1071	-1071	-1071	-1071	-1071	-1071	10^4RMB
		-174	-174	-174	-174	-174	-174	-174	-174	-174	-174	10^4 USD
5.2.5	DHPI - Income Tax	-3723	-3886	-3723	-3886	-3723	-3886	-3723	-3886	-3723	-3886	10^4RMB
		-605	-632	-605	-632	-605	-632	-605	-632	-605	-632	10^4 USD
5.2.6	DHPI share of Net	-1675	-1749	-1675	-1749	-1675	-1749	-1675	-1749	-1675	-1749	10^4RMB

	Profit	-272	-284	-272	-284	-272	-284	-272	-284	-272	-284	10^4 USD
5.2.7	Loan repayable											10^4RMB
												10^4 USD
5.3	Net Cash Flow	9493	9910	9493	9910	9493	9910	9493	9910	9493	9910	10^4RMB
		1543	1611	1543	1611	1543	1611	1543	1611	1543	1611	10^4 USD
	Accumulated Net Cash Flow	189001	198910	208404	218313	227807	237716	247210	257119	266612	276522	10^4RMB
		30722	32333	33876	35487	37030	38640	40184	41794	43338	44948	10^4 USD

Table 6 Government and Investor Overall Benefit

Sr no	Year	合计		2018	2019	2020	2021	2022	2023	2024	2025	Unit
				1	2	3	4	5	6	7	8	
6	Government											
6.1	Government-FV	196149	44.55%	1207	1179	1150	2534	2791	3672	3696	3566	10^4RMB
		31884		196	192	187	412	454	597	601	580	10^4 USD
6.1.1	DHPP sales income (free power)	0										10^4RMB
		0										10^4 USD
6.1.2	Withholding tax	15542		1207	1179	1150	1118	1084	1048	1008	966	10^4RMB
		2526		196	192	187	182	176	170	164	157	10^4 USD
6.1.3	Commercial tax	39625					1071	1071	1071	1071	1071	10^4RMB
		6441					174	174	174	174	174	10^4 USD
6.1.4	Income tax	97891							1071	1115	1055	10^4RMB
		15912							174	181	171	10^4 USD
6.1.5	Share dividends (DHPP) - free share	43090					344	636	482	502	475	10^4RMB
		7004					56	103	78	82	77	10^4 USD
6.2	Government-PV(ic=10%)	12674	51.34%	423	376	333	667	668	799	731	641	10^4RMB
		2060		69	61	54	108	109	130	119	104	10^4 USD
7	Investor											10^4RMB
												10^4 USD
7.1	FV	244175	55.45%				1952	3602	2731	2843	2690	10^4RMB
		39690					317	585	444	462	437	10^4 USD
7.2	PV(ic=10%)	12011	48.66%				514	862	594	563	484	10^4RMB
		1952					84	140	97	91	79	10^4 USD

Table 6 Government and Investor Overall Benefit

Sr no	Year	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	Unit
		9	10	11	12	13	14	15	16	17	18	
6	Government											
6.1	Government-FV	3955	3953	3996	3887	4297	4286	4283	4125	4482	4446	10^4RMB
		643	643	650	632	698	697	696	670	728	723	10^4 USD
6.1.1	DHPP sales income (free power)											10^4RMB
												10^4 USD
6.1.2	Withholding tax	920	871	817	760	699	632	561	484	401	311	10^4RMB
		150	142	133	124	114	103	91	79	65	51	10^4 USD
6.1.3	Commercial tax	1071	1071	1071	1071	1071	1071	1071	1071	1071	1071	10^4RMB
		174	174	174	174	174	174	174	174	174	174	10^4 USD
6.1.4	Income tax	1354	1387	1454	1418	1743	1804	1901	1898	2258	2357	10^4RMB
		220	225	236	230	283	293	309	308	367	383	10^4 USD
6.1.5	Share dividends (DHPP) - free share	609	624	654	638	784	779	751	672	752	707	10^4RMB
		99	101	106	104	128	127	122	109	122	115	10^4 USD
6.2	Government-PV(ic=10%)	647	588	540	477	480	435	395	346	342	308	10^4RMB
		105	96	88	78	78	71	64	56	56	50	10^4 USD
7	Investor											10^4RMB
												10^4 USD
7.1	FV	3453	3537	3706	3615	4445	4413	4254	3810	4259	4005	10^4RMB
		561	575	602	588	723	717	692	619	692	651	10^4 USD
7.2	PV(ic=10%)	565	526	501	444	496	448	393	320	325	278	10^4RMB
		92	85	81	72	81	73	64	52	53	45	10^4 USD

Table 6 Government and Investor Overall Benefit

Sr no	Year	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	Unit
		19	20	21	22	23	24	25	26	27	28	
6	Government											
6.1	Government-FV	4453	4305	5338	5268	5237	5042	5358	7420	6469	6706	10^4RMB
		724	700	868	856	851	820	871	1206	1052	1090	10^4 USD
6.1.1	DHPP sales income (free power)											10^4RMB
												10^4 USD
6.1.2	Withholding tax	215	112									10^4RMB
		35	18									10^4 USD
6.1.3	Commercial tax	1071	1071	1071	1071	1071	1071	1071	1071	1071	1071	10^4RMB
		174	174	174	174	174	174	174	174	174	174	10^4 USD
6.1.4	Income tax	2494	2535	2943	2894	2873	2739	2957	4378	3723	3886	10^4RMB
		405	412	478	470	467	445	481	712	605	632	10^4 USD
6.1.5	Share dividends (DHPP) - free share	672	587	1324	1302	1293	1232	1330	1970	1675	1749	10^4RMB
		109	95	215	212	210	200	216	320	272	284	10^4 USD
6.2	Government-PV(ic=10%)	281	247	278	250	225	197	191	240	190	179	10^4RMB
		46	40	45	41	37	32	31	39	31	29	10^4 USD
7	Investor											10^4RMB
												10^4 USD
7.1	FV	3811	3327	7505	7381	7327	6984	7539	11165	9493	9910	10^4RMB
		619	541	1220	1200	1191	1135	1226	1815	1543	1611	10^4 USD
7.2	PV(ic=10%)	240	191	391	350	315	273	268	361	279	265	10^4RMB
		39	31	64	57	51	44	44	59	45	43	10^4 USD

Table 6 Government and Investor Overall Benefit

Sr no	Year	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	Unit
		29	30	31	32	33	34	35	36	37	38	
6	Government											
6.1	Government-FV	6469	6706	6469	6706	6469	6706	6469	6706	6469	6706	10^4RMB
		1052	1090	1052	1090	1052	1090	1052	1090	1052	1090	10^4 USD
6.1.1	DHPP sales income (free power)											10^4RMB
												10^4 USD
6.1.2	Withholding tax											10^4RMB
												10^4 USD
6.1.3	Commercial tax	1071	1071	1071	1071	1071	1071	1071	1071	1071	1071	10^4RMB
		174	174	174	174	174	174	174	174	174	174	10^4 USD
6.1.4	Income tax	3723	3886	3723	3886	3723	3886	3723	3886	3723	3886	10^4RMB
		605	632	605	632	605	632	605	632	605	632	10^4 USD
6.1.5	Share dividends (DHPP) - free share	1675	1749	1675	1749	1675	1749	1675	1749	1675	1749	10^4RMB
		272	284	272	284	272	284	272	284	272	284	10^4 USD
6.2	Government-PV(ic=10%)	157	148	130	122	107	101	89	84	73	69	10^4RMB
		26	24	21	20	17	16	14	14	12	11	10^4 USD
7	Investor											10^4RMB
												10^4 USD
7.1	FV	9493	9910	9493	9910	9493	9910	9493	9910	9493	9910	10^4RMB
		1543	1611	1543	1611	1543	1611	1543	1611	1543	1611	10^4 USD
7.2	PV(ic=10%)	231	219	191	181	158	150	130	124	108	102	10^4RMB
		38	36	31	29	26	24	21	20	17	17	10^4 USD

Table 6 Government and Investor Overall Benefit

Sr no	Year	2056	2057									Unit
		39	40									
6	Government											
6.1	Government-FV	6469	6706									10^4RMB
		1052	1090									10^4 USD
6.1.1	DHPP sales income (free power)											10^4RMB
												10^4 USD
6.1.2	Withholding tax											10^4RMB
												10^4 USD
6.1.3	Commercial tax	1071	1071									10^4RMB
		174	174									10^4 USD
6.1.4	Income tax	3723	3886									10^4RMB
		605	632									10^4 USD
6.1.5	Share dividends (DHPP) - free share	1675	1749									10^4RMB
		272	284									10^4 USD
6.2	Government-PV(ic=10%)	61	57									10^4RMB
		10	9									10^4 USD
7	Investor											10^4RMB
												10^4 USD
7.1	FV	9493	9910									10^4RMB
		1543	1611									10^4 USD
7.2	PV(ic=10%)	89	84									10^4RMB
		14	14									10^4 USD

Chipwi Nge HydropowerStation (Construction Power Plant) for Hydropower Project in Upper Reaches of AyeyawadyRiver

Environmental Impact Report

Changjiang Survey, Planning, Design and Research Limited Co.

Dec. , 2013

Chipwi Nge Hydropower Station (Construction Power Plant) for Hydropower Project in Upper Reaches of AyeyawadyRiver

Environmental Impact Report

Statement

Changjiang Survey, Planning, Design and Research Limited Co.

Dec. , 2013

Chipwi Nge Hydropower Station (Construction Power Plant) for Hydropower Project in Upper Reaches of AyeyawadyRiver

Environmental Impact Report

Compiling unit: Changjiang Survey, Planning, Design and Research Limited Co.

President: Niu Xinqiang

Chief engineer: Yang Qigui

Approved by: Zhao Chengsheng

Ratified by: Wang Xiaomao, Huang Yan, Zhang Hui

Reviewed by: Tan Changli,Xu Chengjian, Zhang Xi

Checked by: Zhou Wei, Zhang Zhongwei,Lu Jinlong

Compiled by: Zhou Wei, He Yunjiao, Xiao Zhihao, Fan Xiaolin

Huang Hongming, Ke Xuesha, Wu Conglin, Ma Li

Wang Ying, Li Huiling, Li Xiaoling, Xu Tao

Units and persons involved in environmental impact assessment of hydropower development in upper reaches of AyeyawadyRiver:

Changjiang Survey, Planning, Design and Research Limited Co.: --EIA

Wang Xiaomao	Zhang Hui	Tan Changli	Huang Jiawen
Xie Hongzhong	Zhou Wei	Zhang Xi	Zhang Zhongwei
Fan Xiaolin	Xu Chengjian	Huang Hongming	Cai Guizhen
Ke Xuesha	Liao Qizhi	Ma Li	Wang Ying
Li Huiling	Li Xiaoling	Xu Tao	Huang Bin
Wang Kun	Xue Peng	Jiang Jiandong	Zhao Yuanxiang
Quan Hui	Chen Zhang	Zheng Xiandong	Hu Jianhua
Chen Jiangang	Xiao Haibo		

Ministry of WaterResources&ChineseAcademy of Sciences, Institute of Hydroecology--Aquatic organism

Qiao Ye	Hu Juxiang	Xu Wei	Zheng Haitao
Zhao Xianfu	Yang Zhi	Wang Hongjun	Chi Shiyun
Ma Peiming	Chen Mingxiu	Wang Li	Cai Yupeng
Wang Xiang	Zhang Yichao		

SouthChinaBotanical Garden, ChineseAcademy of Sciences: --Terrestrial plants

Xia Nianhe	Gao Xinfen	Cao Honglin	Deng Yunfei
Xu Bingqiang	Zhang Jinping	Zhou Lianxuan	Wang Jun
Zhou Wei	Wu Linfang	Fang Zhiqiang	Hu Qiming
Li Zexian	Wu Deling	Chen Wenjin	Wu Guangnan

South China Institute of Endangered Animal: --Terrestrial animals

Hu Huijian	Hou Baihua	An Xincheng	Peng Boyong
Liu Jincheng	Wang Xincai	He Bing	Wei Qilang
Fei Dongbo			

Biodiversity And Nature Conservation Association:

Htin Hla	U Nyo Maung	Su Su	Zau Lunn
Myint Pe	Tint Wai	Thaung Htut	Di Moe Htun
Thaung Htut	Than Htay Oo	Aung Kyaw Win	L. Tue Nam
Myint Aung	Win Myint	Thin Thin Su	Khin Swe Lwin
Khin Khin Soe	Nay Phyo Aung	Kyaw Soe Naing	Swe Swe aung
Kalaya Lu	Tazar Aung	Mg Aung Aung	Thandar Win
Thida Nyein	Maythu Htun	Myo Min Htun	Kyaw Naing Oo
Aung Than Soe	Yan Naing Hein	Oum Kwe Shein	Thaw Zin
Kyaw Swar Aung	Nay Myo Win	Myin Thura Kyaw	Min Thein Htet
Aung Ko Ko	Khin Mar Lwin	Khin Sandar Hlaing	Naing Naing Win
Phyo Thidar	San Wai Tint	Than Than Htay	Nay Myo Aung
Aung Moe			

Table of Contents

1 Executive Summary 1
1.1 Project background 1
1.2 Myanmar laws & regulations 2
1.3 Project overview 3
1.4 Environment status 7
1.5 Environmental impact assessment 10
1.6 Social impact assessment 12
1.7 Environmental risk assessment 14
1.8 Management plan 16
1.9 Conclusion 20
2 General rules 22
2.1 Assessment purpose 22
2.2 Assessment principles 22
2.3 Project assessment types 23
2.4 Assessment basis 23
2.5 Assessment scope 24
2.6 Goals of environmental protection 24
2.7 Working procedures of environmental impact evaluation 25
2.8 Overview of the finished works 25
3 Laws and regulations of Myanmar 27
3.1 Environmental policies of Myanmar 27
3.2 Environmental protection law of Myanmar 27

3.3 Myanmar's laws and regulations related to environmental protection..27
3.4 International conventions signed by Myanmar.....28
4 Project overview.....30
4.1 Drainage basin planning, development and utilization.....30
4.2 Necessity of project construction.....33
4.3 Geographical location of the project.....34
4.4 Project development task, scale and operating way.....36
4.5 Project junction layout and major buildings.....39
4.6 Engineering construction planning.....41
4.7 Land occupation and resettlement of inhabitants.....56
4.8 Project investment.....57
5 Environmental Status.....58
5.1 Overview of basin environment investigation.....58
5.2 Natural environment.....59
5.3 Ecological environment.....63
5.4 Social environment.....76
5.5 Status of environmental quality.....82
5.6 Main environmental problems.....83
5.7 Environment trends analysis of project zero.....85
6 Environmental Impact Assessment (EIA).....88
6.1 Hydrological regime.....88
6.2 Water environment.....90
6.3 Aquatic organisms.....92
6.4 Terrestrial organisms.....92

6.5 Soil erosion ... 93
6.6 Acoustic environment ... 94
6.7 Atmospheric environment ... 94
6.8 Solid waste ... 94
6.9 Environmental geology ... 95
7 Social Impact Assessment (SIA) ... 96
7.1 Social economy ... 96
7.2 Religious and ethnic culture ... 97
7.3 Indigenous people ... 97
7.4 Women and other vulnerable groups ... 98
7.5 Land use ... 98
7.6 Water resources utilization ... 98
7.7 Infrastructure ... 99
7.8 Population health ... 100
7.9 Personnel training ... 101
8 Environmental risk assessment ... 103
8.1 Environmental risk identification ... 103
8.2 Environmental risk analysis ... 103
8.3 Environmental risk prevention measures ... 105
8.4 Risk accident emergency plan ... 106
9 Environmental impact economic benefit and lossv analysis ... 110
9.1 Environmental economic benefit ... 110
9.2 Loss on environmental impact ... 115
9.3 Cost-benefit analysis on environmental impact ... 115

10 Public participation 116

10.1 Characteristics of Chipwi Nge Hydropower Station 116

10.2 Public participation 116

10.3 Conclusion 118

11 Environmental management plan (EMP) 119

11.1 Mitigation measures and implementation for environmental impacts 119

11.2 Environmental management 139

11.3 Environmental supervision 143

11.4 Environmental monitoring 144

11.5 Environmental protection investment 149

12 Assessment conclusions and recommendations 153

12.1 Assessment conclusions 153

12.2 Suggestions 153

Attached Figures:

Attached Figure 1: Geographic Location Map of Construction Power Plant

Attached Figure 2: Drainage Map of Construction Power Plant

Attached Figure 3: Layout Plan of Construction Power Plant Complex

Attached Figure 4: Longitudinal Profile of Water Diversion System of Construction Power Plant

Attached Figure 5: General Layout Plan of Construction Power Plant

Attached Figure 6: General Layout Plan of Dam Site of Construction Power Plant

Attached Figure 7: General Layout Plan of Plant Site of Construction Power Plant

Attached Figure 8: Layout Plan for Construction Adit of Water Diversion System of Construction Power Plant

Attached Figure 9: Sketch Map about External Traffic of Construction Power Plant

Attached Figure 10: Land Acquisition Scope of Construction Power Plant

Attached Figure 11: Layout Plan for Environmental Monitoring Points (Ecology & Surface Water) of Construction Power Plant

Attached Figure 12: Layout Plan for Environmetnal Monitoring Points (Water, Air & Sound) in Dam Site of Construction Power Plant

Attached Figure 13: Layout Plan for Environmental Monitoring Points (Water, Air & Sound) in Plant Site of Construction Power Plant

ACRONYMS AND ABBREVIATIONS

BANCA	Biodiversity And Nature Conservation Association
BIA	Biological Impact Assessment
BOT	Build, operate, and transfer
CBD	Convention on Biological Diversity
CISPDR	Changjiang Institute of Survey, Planning, Design & Research
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CMS	Convention on Migratory Species
CPI	China Power Investment Corporation
CR	Critically Endangered
DBH	Diameter at Breast Height of a plant
DD	Data Deficient
DHPI	Department of Hydroelectric Power Implementation
EIA	Environmental Impact Assessment
EN	Endangered
EIS	Environmental Impact Statement
EW	Extinct in the Wild
EX	Extinct
GPS	Global Positioning System
IUCN	The World Conservation Union (International Union for Conservation of Nature and Natural Resources)
KIA	Kachin Independent Army
kW	Kilowatt
kWh	Kilowatt hour
LC	Least Concerned
MW	Megawatts
mg/l	Milligram per liter
NDAK	New Democratic Army of Kachin
NP	National Park
NT	Near Threatened
NTFP	Non TimberForest Product
NWCD	Nature and Wildlife Conservation Division
PAS	Protected Areas System
VU	Vulnerable
WCD	World Commission on Dams
WCS	Wildlife Conservation Society
WS	Wildlife Sanctuary
WWF	World Wide Fund For Nature

1 Executive Summary

1.1 Project background

AyeyawadyRiver basin above Myitkyina owns abundant water resources and has relatively high development value. In recent years, the Government of Myanmar classifies the hydropower development as national priority as per the demand of social & economic development and meanwhile, transforms its advantage of resources to economic superiority. In 2005, Chinese investment in Myanmar ranked 11th in foreign investment and the Government of Myanmar expected to make use of Chinese capital and technology to develop its own hydropower resources. In October 2006, the Government of Myanmar invited China Power Investment Corporation (hereinafter referred to as ―CPI”) on the third China-ASEAN Expo (CAEXPO) to develop the hydropower resources of AyeyawadyRiver and Chindwin River etc. However, in view of market risk and such factors, CPI only decided to invest and develop the hydropower project in upper reaches of AyeyawadyRiver.

In December 2006, Ministry of Electric Power No. 1 Myanmar (hereinafter referred to as ―MOEP1”) signed the *Memorandum of Understanding on Hydropower Projects in NmaihkaRiver, MalikhaRiver and Chipwi Nge of Ayeyawady River, Myanmar*. In January 2007, Changjiang Survey, Planning, Design and Research Limited Co. (hereinafter referred to as ―CDC”) was entrusted by CPI to undertake the survey, planning, design and research works for the full process of Chipwi Nge Hydropower Station. According to field survey, CDC analyzed the hydropower resources and construction conditions of 12 tributaries nearby Myitsone and Chipwi hydropower stations and decided to build Chipwi Nge Hydropower Station in ChipwiRiver after sufficient discussion with CPI.

At the end of March 2007, CDC started the site investigation and hydrologic survey works and carried out the planning & design works based on it. In addition, CDC completed the *Feasibility Study Report of Chipwi Nge Hydropower Station in Upper Reaches of Ayeyawady River* in September 2007.

CDC, being entrusted by CPI Yunnan International Power Investment Co., Ltd. (hereinafter referred to as ―CPIYN”), carried out the environmental impact assessment and survey work for hydropower development in upper reaches of Ayeyawady River together with Institute of Hydroecology of Ministry of Water Resources & Chinese Academy of Sciences (hereinafter referred to as ―IHE”), South China Botanical Garden, Chinese Academy of Sciences (SCBG), South China Institute of Endangered Animals (SCIEA) and Biodiversity And Nature Conservation Association (BANCA). In 2009, a joint investigation team consisted of both Chinese and Myanmar parties aiming for finding out the ecological environment of the river basin carried out a deep investigation on the ecological environment in upper reaches of Ayeyawady River (including areas affected by 7 hydropower stations including Myitsone) and colleted the data about attitude of those people affected by the construction of the hydropower project, environmental issues concerned and requirements by means of questionnaire and interview. The team formally started works in January 2009 and completed in May, five months in total; and the rest work was completed by BANCA in July. Around 260 persons joined in the joint investigation, including more than 100 Chinese & Myanmar experts. After completing the survey works, IHE, SCBG and SCIEA separately completed the results of special study on aquatic and terrestrial ecology. BANCA also conducted, together with Chinese experts, the identification of specimens and the communication of survey results according to the survey data; completed the corresponding investigation and submitted the

survey result report to CPIYN in October 2009.

In March 2010, CDC completed the *Environmental Impact Report of Hydropower Development in Upper Reaches of Ayeyawady River*, which was submitted by CPIYN to MOEP1 in May 2010 and approved by MOEP1 in January 2011.

According to the *Environmental Protection Law* promulgated in March 2012 in Myanmar and the latest requirements of the Government of Myanmar regarding project approval in Myanmar, CDC, being entrusted by CPIYN in September 2013, completed the *Environmental Impact Report of Chipwi Nge Hydropower Station (Construction Power Plant), Hydropower Project in Upper Reaches of Ayeyawady River* in December 2013 in the light of the existing data related to environmental and social assessment.

Changjiang Institute of Survey, Planning, Design and Research (briefly called ―Changjiang Design Institute" and hereinafter referred to as CISPDR), founded in Feb.1950 and affiliated to Changjiang Water Resources Commission, Ministry of Water Resources of China, is a stated-owned high-tech enterprise approved by the State and the international Contractor certified by Ministry of Commerce of China, mainly engaged in engineering survey, planning, design, scientific research, consulting, construction supervision, construction management and EPC contracting for the projects in China and abroad. It is one of the first batch certified comprehensive Grade A Survey and Design Enterprise in China and always ranks the top in the National Top 100 Survey & Design Enterprise with the strongest comprehensive strength.

CISPDR has 1959 employees with professional titles, including 2 academicians of Chinese Academy of Engineering, 3 National Masters for engineering Survey and 1 National Master for engineering design, 1 Candidate in the National Talent Program of New Era, 18 Candidates in 5151 Talent Program of Ministry of Water Resources, 4 Young Experts With Outstanding Contributions, 67 experts entitled to Government Special Allowances, 150 professorate senior engineers, 745 senior engineers and over 1000 registered engineers and Certified Public Accounts. With the comprehensive Grade-A certifications of engineering survey and engineering design and over ten other Grade-A Certifications, CISPDR, based in Wuhan, the Central City of China, has set up branches offices in 7 provinces and municipalities named as Hubei, Hunan, Henan, Chongqing, Shanghai, Guangdong and Tibet.

CSPDR has perfect Quality Management System and H.S.E Management Systems. CISPDR always sticks to the quality principle of "Contributing Quality Products by Scientific Management and Sustaining Improvement, Surpassing Customer's Expectation by Advanced Technology and Sincere Services". 1.2 Myanmar laws & regulations

To reasonably develop water, land, forest, mineral, marine and other natural resources and prevent degradation of natural & ecological environment, the federal government of Myanmar promulgated *Agenda and Environmental Policies of Myanmar in the 21st Century* on Dec. 5th 1994, stipulating that:

―People, cultural heritage, environment and natural resources are the first wealth of the country. Our environmental policy is aimed at considering the possible environmental impact during the development and realizing the harmony and balance between economic development and environmental protection, so as to improve the life quality of our people. Each country has its sovereignty to use natural resources in compliance with its environmental policy but must be careful to not exceed its jurisdictional limits or infringe the interests of

other countries during the development of natural resources. The country and every citizen have the liability to protect the current and future natural resources and should always deem environmental protection as the key target during the development process."

On March 30th 2012, *Environmental Protection Law* was promulgated after being approved by the Federal Parliament and signed by President U Thein Sein. *Environmental Protection Law* of Myanmar is comprised of 42 articles in 14 chapters, mainly including tenet of environmental protection law, duties & responsibilities of the environmental protection department, environmental quality standard, environmental protection, urban environment management, natural resources and cultural heritage protection, project permit and punishment etc.

According to the existing data, the federal government of Myanmar has not issued any law or regulation related to the environmental impact assessment. Nowadays, major Myanmar laws related to environmental protection include *Forestry Law of Myanmar*, *Wildlife and Natural Area Protection Law* (1994), *Water Resources and River Protection Law* (2006), *Mineral Resource Law* (1994), *Fresh Water Fishery Law* (1991) and *Marine Fishery Law of Myanmar* (1990).

1.3 Project overview

1.3.1River basin

AyeyawadyRiver basin is situated at north latitude 15°30'~ 28°50' and east longitude 93°16'~ 98°42', and originates from the southwest foot of BoshulaMountains in Zayu County Tibet China. It is named Jitaiqu in Tibet and DulongRiver in Yunnan. It is called as Nmaihka River after flowing into Myanmar from Maku, Gongshan County Yunnan Province and only called as Ayeyawady River after converging with Malikha River in Myitsone Town around 45km above Myitkyina. AyeyawadyRiver has a total mainstream length 2714km and the catchment area approximately 410,000km^2, about 60% of the total water area in Myanmar.

Nmaihka River, 353km long in total, is the main source of Ayeyawady River, with the catchment area around 24,200km^2 (including 4,200km^2 in China) and the natural head about 1010m. Malikha River originates from the south foot of the Himalayas in the north of Myanmar, has three sources i.e. left, middle and right, 375km long in total, with the catchment area around 23,000km^2 and the natural head about 4470m. Catchment area of the upper reaches of AyeyawadyRiver is around 47,300km^2 (including 4,200km^2 inChina).

Chipwi River is a primary branch on the left bank of Nmaihka River, with the geographic coordinates 98°8′~98°28′EL and 25°30′~25°52′NL, originates from Gaoligong Mountain in China-Myanmar border area, from southeast to northwest and finally flows to Nmaihka River nearby ChipwiTown. Chipwi River has the catchment area 743.6km^2, length 58.0km, fall around 3,000m, gradient 52‰ and average annual flow around 54.0m^3/s.

1.3.2 Hydropower planning in the river basin

In December 2006, MOEP1 and CPI signed the Memorandum of Understanding on Hydropower Projects in NmaihkaRiver, MalikhaRiver and Chipwi Nge of Ayeyawady River, Myanmar. CDC, being entrusted by CPI, completed the Planning Report of Hydropower Development in NmaihkaRiver, MalihkaRiver and Chipwi Nge Hydropower Station of Ayeyawady River, Myanmar in December 2007; and completed the Feasibility Study Report of Chipwi Nge Hydropower Station (Construction Power Plant), Hydropower Project in Upper Reaches of AyeyawadyRiver in October 2009.

According to the characteristics of Ayeyawady River basin above Myitkyina and the

requirements of national economic development of Myanmar on the river development, hydropower development in the upper reaches is done for purpose of power generation as well as flood control and improving the shipping and irrigation conditions in the lower reaches etc. Based on comprehensive analysis and comparison with respect to integrated utilization efficiency, technical conditions and economic indexes etc., the recommended scheme for cascade development of AyeyawadyRiver basin above Myitkyina is proposed as follows:

Nmaihka River and Ayeyawady River: Yenan (1010m) – Kaunglanhpur (875m) – Pisa (665m) – Wutsok (525m) – Chipwi (400m) – Myitsone (245m);

MalikhaRiver: Laza (370m)

According to the hydropower planning of the river basin and the preliminary work conditions of Chipwi Nge Hydropower Station, recommended scheme for cascade hydropower development of Ayeyawady River basin above Myitkyina specifies the total installed capacity 21,600MW and the annual power generation 111.09 billion kW·h.

In the light of MOA, it is planned to complete the development of hydropower project in upper reaches of AyeyawadyRiver within 15 years. According to the development conditions and the preliminary works, Myitsone and Chipwi stations will be developed in near term; Wutsok, Pisa, Kaunglanhpur and Laza stations are ranked amongst the second batch of projects to be developed while Yenan Station is the third batch.

1.3.3 Construction necessity of Chipwi Nge Hydropower Station

The project area is beyond the scope of Myanmar national grid and thus encounters with serious power shortage. The construction of Chipwi Nge Hydropower Station is capable of meeting the power demand for construction of Myitsone and Chipwi stations and guaranteeing the smooth implementation of hydropower development in the river basin. In addition, the project area has very rich natural resources but quite low level of development & utilization. Thus, Chipwi Nge Hydropower Station will play an important role in developing local resources, improving the local economy and increasing the life quality of local residents. Meanwhile, the construction of Chipwi Nge Hydropower Station means the formal commencement of hydropower development project in AyeyawadyRiver basin above Myitkyina, Myanmar. This is a strategic project for win-win results of China and Myanmar, necessary for mutual benefits and joint development, and is a specific action for enhancing long-term strategic cooperation between those two countries.

Chipwi Nge Hydropower Station has been left aside due to the suspended Myitsone Hydropower Station and the hindered Chipwi Hydropower Station. Meanwhile, related government of Myanmar required to speed up the construction of Chipwi Nge Hydropower Station repeatedly to supply electric power to KachinState since power supply is insufficient and both life quality & economic development are affected in KachinState. Chipwi Nge Hydropower Station is now supplying electric power for commercial use to the local, in order to mitigate the existing short supply of electric power in the northern part of Myanmar, bring benefits to the local residents, promote the local socioeconomic development and meanwhile lower down the loss due to nonuse of Chipwi Nge Hydropower Station.

1.3.4 Geographical location

Chipwi Nge Hydropower Station dam is sited at Chipwi River – a tributary on left bank of Nmaihka River, in a straight river valley around 1.5km~2.0km upstream Labang Bridge, approximately 15km from ChipwiTown. The powerhouse is on the left bank of NmaihkaRiver, around 9km from the upstream ChipwiTown, 62km from the downstream Myitsone Hydropower Station and 20km from the upstream Chipwi Hydropower Station.

1.3.5Development task, scale and operation mode

This project is developed for purpose of power generation and will act as the construction power plant of Myitsone and Chipwi stations developed in near-term for hydropower resource development of AyeyawadyRiver basin above Myitkyina. Meanwhile, to meet the requirement on construction power plant, this project will supply electric power for commercial use to KachinState as required, in order to mitigate the existing short supply of electric power in the northern part of Myanmar, bring benefits to the local residents and promote the local socioeconomic development. Chipwi Nge Hydropower Station belongs to the daily regulation type.

Chipwi Nge Hydropower Station has the normal pool level 740m, check flood level 745.99m, corresponding reservoir capacity 789,000m^3 and 1,234,000m^3 respectively, installed capacity 99MW and annual average power generation 599 million kW·h. Chipwi Nge Hydropower Station belongs to the daily regulation type. According to *Standard for Flood Control* (GB50201-94) and *Standard for Classification and Design Safety of Hydropower Project* (DL5180-2003), the project is a Class-III middle-sized project. The corresponding main structures such as dam, water diversion and power generation system, are ranked Grade 3; secondary structures Grade 4, and temporary structures Grade 5. The structural safety class of hydraulic structures is Class II.

1.3.6Project layout and main structures

Chipwi Nge Hydropower Station is a diversion type and main structures include dam, water diversion and power generation system, diversion structure and power house etc.

Recommended layout of Chipwi Nge Hydropower Station is described as follows: dam and water intake are located at Chipwi River, concrete gravity dam, dam type intake; diversion line adopts the polygonal scheme, internal diameter of tunnel 4.0m; power house and tailrace tunnel on left bank of Nmaihka River; open type power house; axis of the power house inclines to axis of the penstock at an angle of 30°.

1.3.7General layout and progress

(1) General layout

The construction area is arranged concentratedly in different zones and can be divided into three planning zones, i.e. dam, diversion tunnel and power house construction zones. Auxiliary construction facilities consist of living and production facilities. Living facilities include construction camps and offices; while production facilities include concrete mixing systems, processing plant for various materials, material warehouse and stockpile yards, machine parking and maintenance lots etc.

Sandstone material processing and concrete mixing system, construction area at both banks of the dam site, office & living quarter are arranged downstream close to dam site. Machine parking lots, comprehensive processing yards for different materials, and stockpile yards are located upstream at the free locations with high elevation on the right bank. One spoil yard is located at each bank downstream the dam site.

Camps and offices are near the access road at elevation of 267.0m; other production facilities are arranged in the lower part of the project site at elevation of 235.0m, where the excavation wastes of the project area is dumped for leveling of the ground in the early stage and the excavation waste is piled along riverside the later stage.

The temporary construction road leading to mouth of each construction adit is around 28.0km long and 4.0m wide. At the mouths of 2$^{\#}$& 3$^{\#}$ construction adits, site leveling is done and meanwhile excavation waste from excavation of adit and main tunnel is piled nearby them.

Excavation waste from $1^{\#}$ adit and a part of excavation waste from the main tunnel are transported to the spoil yard of the dam site; while excavation waste from $4^{\#}$, $5^{\#}$ and $6^{\#}$ adits and a part of excavation waste from the main tunnel are transported to the spoil yard of the plant area.

(2) Construction diversion

Water retaining dam of Chipwi Nge Hydropower Station is around 110m downstream the breached dam of cement-laid stone masonry, where there is large discharge in flood season and small discharge in dry season. A flood plain at el. 705m~713m is on the left bank of dam site. The river during the low-water season flows mainly from the river channel of the right bank. In addition, according to the analysis on dam scale and amount of works, concrete placement for the dam can be finished in one low-water period; therefore, it is suitable to close the river at one shot using tunnel or bottom outlets for diversion.

Water retaining dam of Chipwi Nge Hydropower Station is classified as Grade 3 permanent hydraulic structures. According to *Specifications for Construction Planning of Water Resources and Hydropower Projects* (SDJ338-89), the diversion structures, which protect the construction of permanent structures, are classified as Grade 5. The downstream and upstream earth-rock cofferdam and diversion tunnel for water-retaining dam are classified as Grade 5 structures.

In this scheme, permanent spillway and sediment sluice are used as diversion bottom outlet, which is located at the non-overflow dam section at the left of overflow dam section. For upstream of diversion bottom outlet, headrace channel formed by excavating foot of mountain is applied for diversion, while for downstream, the discharge chute of permanent spillway and sediment sluice is used for discharge.

(3) Construction progress

The total duration of the project is 32 months, in which the construction preparation period 3 months, the construction period of main works 26 months. The second and third units occupy 4 months of the straight-line period.

(4) Resources

Soils, rock block, sand & gravel and timber are all locally supplied; while other building materials need to be supplied by the border of Yunnan China with the haul distance over 100km.

Mobile and fixed type air compressors are provided to supply the air for construction with no other air supply system. Construction water can be directly pumped from the river by submersible pumps. Domestic water is as the same as potable water used by the local habitants; it is, therefore, preferably to take from local tap water or build small basins for water supply. Construction and living electricity should be supplied by self-provided power of the construction zones.

There are around 290 sets of construction machinery and vehicles. The number of labor during construction peak of main works is 830.

1.3.8 Inundation, land requisition and resettlement

The reservoir provides a water area 9.7hm^2 and an inundated land area of 8.1hm^2. The permanent land requisition is 7.6hm^2, including 4.8hm^2 for construction of the dam site (the overlap between dam site area and reservoir area is included in the reservoir area) and 2.8hm^2 for construction of power house; while the temporary land requisition is 56.39hm^2 in total.

As there is only a little garden and timberland without housing in the scope of land requisition, the impacts on production and living for the local people by land requisition of this

construction is fairly small, excluding resettlement.

1.3.9 Investment estimate

Total static investment of the project is 1.119 billion Yuan.

1.4 Environment status

1.4.1 General of environment status survey

According to the *TOR of EIA on Hydropower Development of Ayeyawady River Basin Above Myitkyina* and the requirement of Myanmar government authorities, under the organization of CPIYN, CDC and BANCA, a joint investigation team comprised of SCBG, SCIEA, IHE and BANCA is established to find out the ecological environment of the river basin. It conducted a deep investigation on the baseline conditions of the aquatic lives, terrestrial plants & animals, environment quality and social environment etc in seven proposed cascade hydropower stations. It also collected data about the attitude of the affected people, the environmental issues concerned and the requirement by means of questionnaire and interview. The joint investigation started officially in January and completed in May 2009, lasting for 5 months. The rest work was completed by BANCA in July. About 260 people joined the investigation, among which there are more than 100 experts from China and Myanmar.

1.4.2 Natural environment

(1) Topography & geomorphy

The reservoir area is of low-medium mountainous landform with steep mountains on both banks and covers the Level-I & II terraces distributing along the river. There is a gully 1000m in length developed on the right bank of the reservoir head region. The river valley is 5m~30m in width and 5m~20m in cutting depth, with a flow approximately 1.5m^3/s. The gully bottom consists of gentle slopes and platforms made of mudflow deposits.

There are wide and thick mountains on both banks of the dam site. There is well-conserved vegetation. Level-I & II terraces develop on the upstream of the upper dam axis on the right bank, dipping to the riverbed and inclining downstream, basically in consistent with the riverbed gradient. Primary terrace develops on the downstream of the lower dam axis on the left bank along ChipwiRiver, dipping to the riverbed and inclining downstream. There are gullies of various sizes developing on both banks at the dam site, with perennial water flowing.

The power house area has low-medium mountainous landform at the southern edge of the Kachin mountain region, on the slope at the left bank of NmaihkaRiver, around 9km downstream ChipwiTown. In rainy season, the surface layer of the slope may be easily washed away, with the silty clay and the completely weathered layer scoured into gullies and locally into earth channels, leading to fracture of the slope surface. There are small gullies developing along the slope in the power house area, among which the gully around 800m upstream and the one at the downstream side are relatively large, where there is perennial water flowing.

(2) Hydrogeology

Chipwi Nge Hydropower Station is located in the Kachin mountain area, north of China-MyanmarMountains. Geotectonic unit belongs to Qinghai – Tibet rejuvenated orogen. There are mainly Chipwi fault stretching along NmaihkaRiver and Chipwi- Tengchong fault of ChipwiRiver stretching from east to west. Chipwi fault was inactive since 1,180,000 years ago. No active fault was observed within the range of 5km from the near-field region. The basin is located in an area with relatively stable regional tectonics.

The seismic peak acceleration over 10% in the area is 0.20g for 50 years with a basic earthquake intensity of VIII.

(3) Climate

The project site lies in Asia southwest monsoon zone, whose climate is affected by the southwest monsoon. There are three seasons in a year, i.e. hot season from March to May; wet season from June to October; and cool season from November to February. The average air temperature in January, the coolest month, ranges from 20℃ to 25℃; the average air temperature in April, the hottest month, ranges from 25℃ to 30℃. According to the statistical data of Lushui Station in the neighboring basin of the construction power station, the average days of thunderstorm for many years are 52.1d. According to the statistical data of Myitsone meteorological station from 2003 to 2004, the annual average water temperature is 23.0℃.

There is abundant rainfall in the basin with the annual rainfall of 2,000mm~4,000mm in the north and the delta, and that of 600mm~1,000mm in the plains at the middle stream of river. The maximum rainfall usually occurs in July, while rainfall is little from March to May. For instance, in Bhamo region in upper reaches of AyeyawadyRiver, the width of river is less than 500m in February, while it reaches over 3km in August. The range of water level is around 10m in a whole year.

(4) Hydrology and sediment

The runoff supply of AyeyawadyRiver basin relies on rainfall during flood season and on deep layer groundwater and some snowmelt during dry season. In ChipwiRiver basin, storms mainly occur from June to September and occur in June most frequently, accounting for 27% of the total statistical years. The 1-in-500 year flood is 2540 m^3/s, 1-in-100 year flood $1980m^3/s$ and 1-in-20 year flood 1320 m^3/s.

The average annual flow of Chipwi Nge Hydropower Station is $40.1m^3/s$; the average annual runoff is $1,260,000,000m^3$ and the average annual runoff depth is 2288mm. The controlled catchment area above the dam site of Chipwi Nge Hydropower Station is $552.3km^2$; the average annual flow at the dam site is $40.1m^3/s$ and the annual runoff is $1,260,000,000m^3$.

The average annual sediment transport quantity of Chipwi Nge Hydropower Station is 724,000t; the average annual bed-load sediment transport quantity is 145,000t and the average annual total sediment transport quantity is 869,000t.

(5) Soil and water & soil erosion

Main earth in the construction area includes brownish-red earth, red yellow earth, yellow earth, yellow brown earth, brown earth and dark brown earth etc. The area along the river is fertile alluvium. The ground slope of the construction area is greater than or equal to 35°; the percentage of coverage of forest and grass is about 60%. The protogene soil erosion of the construction area is mainly medium class.

1.4.3Ecological environment

1.4.3.1 Terrestrial plants

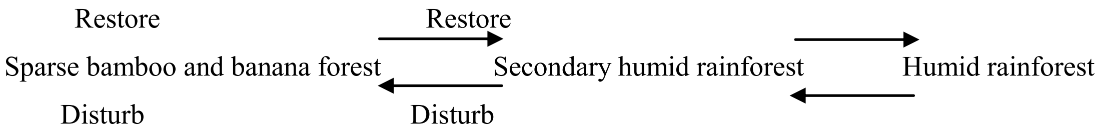
Flora in Chipwi Nge Hydropower Station belongs to tropical Asia (India – Malaysia) region. This region is closely linked with Eastern Himalaysia region in its north and valleys of SalweenRiver taken as boundaries between China region in its east. Floristic elements in this region presents with convergence between east and west and compatibility between north and south.

According to the investigation, there are 556 species, 357 genera and 127 families of vascular plants in the Section Chipwi of Nmaihka River, including 21 families of Pteridophyta, 3

families of Gymnospermae and 103 families of Angiosperm. Tropical elements are very rich in this region.

According to the investigation results, existing vegetations in the area concerned in this project can be divided into 7 vegetation types, 9 vegetation sub-types and 13 communities. Form. Bombax ceiba and Dendrocalamus spp. of tropical spare tree-bamboo forest are most widely distributed in the project site. The community belongs to secondary vegetations formed after tropical rainforests are destroyed artificially. It is similar to spare monsoon community with respect to its appearance.

Zonal vegetation in the project area belongs to humid rainforest and now is degraded to spare bamboo and banana forest due to man-made interference. Cultivated land is little in this region and only a little has been degraded to shrub; while the riverside shrub is a type of disclimax community and a relatively stable type formed due to influence of periodic fluctuation of the river. Vegetation succession in the regional slope sections is described as below:



According to the investigation, rare and endangered plants in IUCN Red List are founded in Chipwi Section of NmaihkaRiver, including Tetrameles nudiflora, Aquilaria malaccensis Lam., Bhesa sinensis, Dipterocarpus retusus, Craibiodendron stellatum, Cephalotaxus griffithii Hook. f., Dipterocarpus turbinatus Gaertn. f., Taiwania cryptomerioides Hayata, and Bretschneidera sinensis Hemsl. In addition, species of Cyathea spp. and Orchidaceous species listed in CITES Appendices are sporadically distributed in the area.

1.4.3.2 Terrestrial animals

Chipwi Section of Nmaihka River where the project locates has relatively rich resources of wild animals; totally 41 species of mammal belonging to 6 orders, 18 families and 32 genera are recorded; 318 species of birds belonging to 18 orders, 56 families and 136 genera; 13 species of reptile belonging to 2 orders, 5 families and 13 genera; 14 species of amphibian belonging to 1 order, 4 families and 11 genera; and 216 species of butterfly belonging to 11 families and 125 genera.

According to the statistics and survey, totally 39 rare and endangered species are recorded, including 18 species of beast, 16 bird, 3 amphibian and reptile, and 2 butterfly. Totally 28 species are listed in IUCN Red List, including 18 species of beast and 10 bird; and 30 species are listed in CITES Appendices in total, including 17 species of beast, 8 bird, 3 amphibian and reptile, and 2 butterfly.

1.4.3.3 Aquatic animals

Totally 26 species of fish are collected in Nmaihka River, belonging to 3 orders and 4 families, including 18 species of cypriniformes of 2 orders, 7 species of siluriformes of 1 order and 1 species of anguilliformes of 1 order.

In ChipwiRiver section, the utilization of fish resources is of a very low level, both the fishing method and the working tools are simple. There are no professional fishermen. Common fishery harvestings include Schizothorax meridionalis, Tor putitora and Garra qiaojiensis etc.

ChipwiRiver is a primary branch on the left bank of NmaihkaRiver. According to analysis on the habitat of ChipwiRiver, fishes species adapting to the torrential flow habitat such as Scaphiodonichthys, Sisoridae, Glyptothorax and Pseudecheneis are possibly distributed in ChipwiRiver.

1.4.4 Social environment

KachinState is located at the north of Myanmar, abuts on Yunnan ProvinceChina. Total area of KachinState is 89,000km^2, about 13% of Myanmar territory. It consists of 3 counties called Myitkyina, Putao and Bhamo and their governmental 18 towns, with a total population around 1,420,000. Besides Kachin as its main ethnic group, there are also Burman, Shan, Lisu, Axi, Laxi, Yawang, Xianu, Xiadu and Ganan ethnic groups etc.

Agriculture is the pillar industry for KachinState and the principal crops are paddy, sorghum, corn, sugarcane, rape etc. The total planted area of KachinState is about 120,000hm^2 of which 56,700 hm^2 is irrigated land and 20,200hm^2 is interplant area. For the planted area, 70% is paddy field and the rest is dry land, garden land and grove. Paddy is an important crop with the total planted area accounting for 75% of the total planted area. Paddy in this area is mainly planted on the plain and mountain. There is about 5,670km^2 protective forest land which is distributed in Morning, Myitkyina, Bhamo and Shwegu etc. The forest products are teak, hardwood and so on and they are another very important source of income.

Myitkyina is the capital of Kachin State Myanmar, it is the northernmost river port and railway terminal of Myanmar, with a distance of 1480km to Rangoon and 780km to Mandalay, about 45km downstream of the Myitsone at the confluence of the left source (NmaihkaRiver) and right source (MalihkaRiver) of AyayawadyRiver. The permanent residents in Myitkyina City is over 200,000, mainly consisting of Kachin, Shan and Burman nationalities.

According to the preliminary investigation, there is no great mineral resource in this project area. Gold dust appears in NmaihkaRiver and AyeyawadyRiver mainstream section, and gold mining has become an important industry and major source of income for the local residents.

The local epidemics are mainly malarial disease, dengue fever, cholera etc.

1.4.5 Current situations of environment quality

According to the investigation, there is no large-size industrial & mining enterprise in this project area, without source of industrial pollution. In addition, the domestic sewage is little since the reservoir surroundings are sparsely and dispersedly populated; crop farming is mainly adopted in villages within the reservoir area, major crops such as paddy, sorghum, corn, sugarcane, rape etc.; but fertilizer and agricultural chemicals are rarely used.

Entrusted by CPIYN, the Environmental Monitoring Station in Tengchong County, Yunnan Province of China monitored the water quality in sections of the dam site and power plant of Nmaihka River in October 2004. According to the monitoring results, the water quality of both sites is quite good and can meet " Environmental quality standards for surface water "(China, GB3838-2002) .

1.5 Environmental impact assessment

1.5.1Hydrologic regime

Normal pool level of Chipwi Nge Hydropower Station is 740m; and the storage capacity below this normal pool level is about 789,000m^3. This reservoir is a typical river-channel type with daily regulation capacity. The reservoir area is about 0.10km^2 with a backwater length about 0.75km.

After completion of this project, there will be flow-reduction section about 15.9km between the dam site and river mouth. From November to next April, the diversion generation will result in significant decrease of flow below dam and the flow below dam in that period is the ecological flow released from the project (0.53m^3/s). In the meantime, the downstream water

level below dam decreases, however, with confluence of numerous creeks, the flow in the flow-reduction section will increase gradually and the gaps between downstream discharge and water level and the natural condition will decrease gradually.

The power house is located at the main stream of NmaihkaRiver. Chipwi Nge Hydropower Station diverts water from the branch (ChipwiRiver) of NmaihkaRiver to the main stream of NmaihkaRiver. Designed discharge for power generation is 26.46 m^3/s, only accounting for 1.2% of the average annual flow of Nmaihka River at the location of power house. Therefore, there are basically no impact on the water regime of NmaihkaRiver channel upstream the power house.

1.5.2 Water environment

Impacts on water quality of Chipwi River during construction period mainly includes alkaline waste water from mixing, washing and curing for concrete; oily waste water from maintenance of construction mechanical equipment; foundation pit drainage; and domestic sewage from construction personnel etc.

The size of construction is fairly small with little sewage, and the composition of the pollutants is simple. After taking relevant treatment measures, there will be no obvious adverse impact on the water quality of ChipwiRiver, and the impact is temporary. After completion of the construction, the impact will disappear.

After the project being implemented, the normal pool level will be 740m and the backwater length will be about 0.75km. The water level of the reservoir area section will be higher than the level before the dam being built. The water surface will become relatively wider and the water volume in this project and its backwater area will be increasing. The diluting impact will be strengthening and the water quality in the reservoir area will be improved as a whole. The decrease of the discharge capacity between the dam site and the river mouth section will affect the dilution and self-cleaning capacity of the water body.

Chipwi Nge Hydropower Station is provided with daily regulation capacity. Calculated by runoff storage method, a>20. Thereby, the reservoir is identified as a mixed type and there will be not lamination in water temperature of the reservoir. There is no impact on the water temperature of the reservoir by the construction and operation of this project.

1.5.3Aquatic organism

The fish stocks in the water system of NmaihkaRiver are mainly the those adapting to torrential flow. After completion of the project, the fish stocks in the reservoir area will migrate to the upstream torrential flow habitat. As Chipwi Nge Hydropower Station is a development type of low dam diversion, the backwater length for the reservoir area is about 0.75km, and the range of impact on the fishes that adapt to torrential flow (such as Scaphiodonichthys, Sisoridae, Glyptothorax and Pseudecheneis) by the construction is fairly small. Dam blockage will affect the fish interflow between ChipwiRiver and NmaihkaRiver.

After the project is implemented, the amount of water in the 15.7km river section between the power house and downstream the dam site will be reduced sharply in dry season that will result in population decreasing for planktons and bottom faunas in that river section, so that amount of fish resources in that river section will be reduced accordingly. However, as the fishes in this river section are widely distributed in NmaihkaRiver basin, the construction of the station may only reduce the range of habitat adaptation, and the reduced range is relatively small, so that the range of impact on fishes by reducing the amount of water in the flow-reduction section is limited.

1.5.4Terrestrial organism

The construction activities (such as reservoir inundation, dam & power house construction, construction road, headrace tunnel, adit etc.) of Chipwi Nge Hydropower Station will provide an area of damaged surface vegetation of $12.2hm^2$. The project implementation will not lead to the disappear of species or the sharp decrease of quantities of individuals. In terms of the vegetation in the project area, the damaged vegetation area due to construction is fairly small with a relatively low impact.

All vegetation damaged due to the project construction except for permanent buildings will be restored gradually since the works are completed and the measures of water & soil conservation, afforestation and beautification are taken gradually, and in the construction area, the high air temperature, rich rainfall, fast vegetation grow and strong vegetation resilience. Productivity of the terrestrial plants can be almost restored to their original level by means of manual work.

The reservoir size of Chipwi Nge Hydropower Station is fairly small, and the reservoir area will only be increased by $0.08km^2$ after reservoir impoundment. There is basically no impact on the reptiles and mammals inhabiting around the reservoir area.

Purchase of wild animals by construction or management personnel will promote the wild animal trade activities in the project area, so as to induce the hunters to increase the intensity and frequency of hunting and thus lead to the decrease in quantity of wild animals. Therefore, greater emphasis on control of the construction or management personnel shall be laid.

1.5.5 Soil erosion

The increased soil erosion possibly due to the construction of Chipwi Nge Hydropower Station may be mainly caused by the construction activities such as foundation excavation of dam & power house, excavation of diversion tunnel, borrow site excavation, construction road, auxiliary enterprises and office & living areas, spoil yard etc.

According to the present situations of soil erosion in the project area, total soil erosion possibly caused by the project construction is around 16,262t based on analysis and forecast, including 9,241t newly-increased soil erosion. However, the newly-increased soil erosion can be effectively mitigated and controlled after taking appropriate measures.

1.5.6 Others

All other adverse effects, such as influence on air, sound, solid wastes to a certain extent in the construction area, are temporary, with small range and low level of influence. All those can be effectively mitigated or controlled by taking corresponding prevention measures.

1.6 Social impact assessment

1.6.1Social economy

Chipwi Nge Hydropower Station, with the installed capacity 99MW and the average annual power generation 599,000,000kW·h, is mainly developed for purpose of supplying electric power for the development of Myitsone and Chipwi Hydropower Stations of Ayeyawady River; meanwhile besides meeting the requirement for construction power source, electric power for commercial use will be supplied to Kachin State as required, so as to mitigate the insufficient power supply in the northern part of Myanmar, bring benefits to the local residents, and promote the local socioeconomic development.

The construction of Chipwi Nge Hydropower Station and other cascade stations in upper reaches of Ayeyawady River in sequence will help to improve the external traffic conditions; while the input of capital for project development and construction will bring a great number

of employment opportunities for local people and promote the development of other related industries, thus it will play an active role in improving the life quality of local residents and promoting the economic development. Implementation of Chipwi Nge Hydropower Station will play an important role in promoting the socioeconomic development in the river basin and even in KachinState.

1.6.2 Religious and ethnic culture

Construction of Chipwi Nge Hydropower Station does not involve resettlement or local religious facilities and thus will not affect the regional space combination structure of minority culture. However, foreign culture will possibly affect the local minority culture to a certain extent. Kachin, Shan and Burman nationalities, all relatively great in Myanmar are mainly involved in the project construction, with long culture and history. Thus foreign culture has limited influence on them.

The project construction will help to promote the local economic & social development, improve the life quality of local residents, enhance the further cooperation and unity of various nationalities and solve the problems and difficulties encountered during the development of relationship between local nations.

1.6.3Indigenous people

Indigenous people (the ethnic minorities), as a social group having obvious difference with dominant groups in the society, always belong to the mostly marginalized and weak group in local population. Their economic, social and juridical status always restrict their interest and capacity for protecting their own land, territory and other productive resources, or limit their capacity for obtaining benefit from development projects that they have joined in. Therefore, we should give extensive attention and emphasis on the adverse effect on indigenous people due to reservoir inundation during the construction of Chipwi Nge Hydropower Station and take feasible measures to protect interests of indigenous people.

1.6.4Vulnerable groups (women etc.)

Construction of Chipwi Nge Hydropower Station will bring a number of employment opportunities for the local; while the demand of construction & technical personnel for food and daily necessities etc. during the construction will help to promote the development of the tertiary industry i.e. rendering auxiliary service. Beside mitigating the life stress of vulnerable groups (women etc.), this project will give employment opportunities to them, so as to improve life quality of the women. More capital will be provided to the medical & educational infrastructures if fiscal revenue of the government increases, so as to greatly improve the educational level and physical health of the vulnerable groups.

1.6.5 Land resources

The reservoir has a water area of 9.7hm^2 and the inundated land area 8.1hm^2. Permanent land occupation is 4.8hm^2 in the construction area of the dam site. Chipwi Nge Hydropower Station has relatively small size and small inundated and land occupation area. Thus, it will have little influence on the land resources in the project area.

1.6.6Water resource utilization

AyeyawadyRiver Basin above Myitkyina is located in the northernmost part of KachinState, north of Myanmar, where Myanmar national grid can‘t get access to. There is a severe shortage of power. The government and residents with good economic conditions (shop and hotel owners), have self-equipped small diesel generators to supply power. Chipwi Nge Hydropower Station can, upon its completion, improve the ratio of hydropower resource utilization, provide power guarantee for the local economic & social development, mitigate

the long-term power shortage of local residents, and furthermore play an important role in promoting the water resource development in AyeyawadyRiver.

1.6.7Influence on water use in lower reaches

Upon completion of Chipwi Nge Hydropower Station, there will be a flow-reduction section about 15.7km between the dam site and river mouth. According to the project design scheme, $0.53m^3/s$ ecological flow will be released by the dam. In addition, the nearest two creeks are 1.6km downstream the dam with a catchment area of $10.0km^2$ and $5.45km^2$ respectively. As estimated, the average annual discharge is $0.73m^3/s$ and $0.4m^3/s$ respectively, with $0.53m^3/s$ release from the dam added in, the average discharge of the location 1.6km downstream the dam is up to $1.66m^3/s$.

According to field survey, the residential areas are distributed on a scattered basis on both banks of the river section between the dam site and the river mouth, and these residential areas have a fairly large elevation difference from ChipwiRiver with a long distance. The domestic water for the local people is mainly from the streams and springs nearby without the water directly taken from ChipwiRiver. There are no requirement for irrigation and water supply in the discharge-reducing section. Therefore, Chipwi Nge Hydropower Station will have no great influence on the production and domestic water in the lower reaches upon its completion.

1.6.8 Infrastructure

To facilitate the material transportation, the investor will improve the grade of roads in the northern part of Myanmar, to obviously improve the traffic conditions in the project area, facilitate the travel of local people, and provide convenience for investment promotion and economic development.

Infrastructure construction of Chipwi Nge Hydropower Station are still developing and quite weak. Construction of Chipwi Nge Hydropower Station will increase the economic & social development level in Chipwi and then improve the medical & educational infrastructures in the project area.

1.6.9Population health

Construction personnel will gather at the site during the construction, thus the population density is increased in this region. Diarrhea, virus hepatitis and other intestinal infectious diseases will spread if fails to strengthen the sanitation management environment, drinking water and food. Construction and technical personnel from other regions are more apt to be affected by endemic disease as compared to the local people. The construction personnel from different places may carry with pathogen from their origins. Consequently, corresponding measures for prophylactic immunization and preventing epidemics shall be taken.

1.7 Environmental risk assessment

1.7.1Environmental risk analysis

According to the construction unit plan of Chipwi Nge Hydropower Station, totally two oil depots and one explosive magazine are built during the project construction. However, oil depot and explosive magazine will encounter with emergencies and then possibly lead to explosion accident during the construction, so as to pollute the air and water environment, cause environment risk and will possibly give rise to water supply risk in the downstream construction area; thus it is classified as a new risk. The reservoir will possibly cause geological disaster risk after impoundment; emergent pollution of the reservoir area will possibly lead to water pollution risk; and change in living condition will cause the alteration

of aquatic animals' habitats; possibility of all those risks will increase due to reservoir impoundment.

1.7.2 Environment risk prevention measures

(1) Environment risk prevention measures for oil depot

1) Establish strict safety management system for oil depot, and specify the requirements on oil transport, storage and use.

2) Provide the perfect accident alarming system, guarantee the timely accident treatment; and ensure the normal operation of shockproof, smoke-prevention and lightning protection facilities in the oil depot;

3) Oil depot will be equipped with fire pump and fixed type low-expansion air foam fire extinguishing system in the fire pump house; provided with one semi-aboveground fire water pool with the capacity meeting the demand for one fire extinguishing; and built with the fire water collecting tank, to lessen the damage of nearby water and soils caused by oily fire water; and

4) The oil depot shall be equipped with some emergency equipment and tools for emergency oil leakage control, explosive oil well pump and oil vessels, blockings used for ditch excavation, and special tools & instruments for emergency repair etc.

(2) Environment risk prevention measures for explosive magazine

1) Quantity of explosives in each magazine shall comply with the specification.

2) The magazine shall be built with corresponding protective earth embankment, as per the layout that every two buildings have one protective barrier; the area is provided with gate and wall, distance between the wall and various magazine shall be greater than 15m; sentry shall be deployed in the magazine; and duty room shall be situated at the proper location 250m outside the magazine.

3) Outdoor fire hydrants shall be installed outside the explosive magazine and the shot house. Fire pool shall be sited on a mountain slope outside the magazine; both the water pressure and volume shall conform to the specification.

4) According to the specification, the magazine shall be provide with no any electrical equipment. Power supply line shall adopt concealed cable inside and adopt overhead laying outside the magazine.

5) The magazine shall adopt independent lightning tower for protection, to protect it against direct lightning stroke. All metal parts of the magazine shall be subject to multiple & equipotential grounding, to prevent from static.

1.7.3Emergency plan for risks & accidents

On the premise of taking risk prevention measures, the development unit shall coordinate and organize, jointly with local governmental department, scientific research institutes, construction unit and other such emergency headquarters for risk & accidents, the implementation of risk emergency response plans with respect to emergent environment risks (mainly pollution), for purpose of effectively mitigating the hazard and environment loss after the risks & accidents.

Designate the emergency plan zone, establish the emergency organization and appoint corresponding commanders and site rescuers; provide the special contact information for alarming and communication; popularize the emergency protection measures; and establish the personnel evacuation and removal plan.

1.8 Management plan

1.8.1 Mitigation measures for environmental influence

(1) Water environment protection measures

In view of intermittent drainage and low water volume of the concrete mixing system, the simple sedimentation pond of same form and scale will be adopted for treatment; domestic sewage will adopt packaged treatment facilities; oily sewage of the repair system will use small-size oil separation tank for treatment; for wastewater in the foundation pit, feed the flocculant consisted of copperas and polyacrylamide to the foundation pit, keep still for 2h, pump out water and promptly remove the residual sludge through manual work.

(2) Terrestrial organism protection measures

Attention shall be paid to publicity and education and personnel training. By means of those measures, public awareness of protection of the terrestrial wildlife can be enhanced. This is good for formation of good protection atmosphere.

Cultivated land should adopt crop rotation and intercropping as practical as possible, to reduce burning vegetation for farmland. Meanwhile, local residents should be encouraged to popularize and use energy-saving stove, methane tank and electric power, to decrease the consumption of fire wood, so as to reduce consumption of forest.

Assist the local government to train the local residents, so as to make them step into modern agricultural production from slash-and-burn farming method, to reduce destruction for forest resource especially virgin forest.

Enhance the protection awareness of the construction personnel. Strictly prohibit hunting wild animals, and completely eradicate activities of wildlife and products trade etc. that may cause influence on wild animals in this area.

The works, especially construction roads, shall be done by lowering down and avoiding high cut & fill as practical as possible, to prevent disturbed surface and mitigate the damage to natural ecology and vegetation as much as possible.

The general plan of soil and water conservation measures should be prepared for exposed surface of the temporary soil yard, borrow site, temporary construction area, construction roads. After completing the construction, stabilization of side slope and land reclamation shall be carried out promptly on the periphery of the hydropower stations, borrow site and spoil yard, and suitable species of indigenous plant will be planted for vegetation restoration.

(3) Water and soil conservation measures

Control zones classified for soil & water conservation include main works area, construction road area, construction production & living area, borrow site and spoil yard etc. in this project.

1) Main works area

The main works design has weighed protective measures for excavation of high slope and slopes of headrace tunnel, so as to achieve safe project construction and good soil and water conservation results. The soil and water conservation measures in the main works area are mainly of planning vertical afforestation on excavated slopes in the power house area upon completion of project.

2) Construction road area

Soil and water conservation measures are planned for the construction road combined with project construction and operation. These measures include: slope protection, road drainage etc.

3) Construction production and living area

During the construction period, the appropriate temporary drainage system is planned in the construction production and living area; upon completion of the project, site leveling and afforestation are required.

4) Borrow sites

During mining in the borrow sites, appropriate drainage ditches should be arranged in surrounding areas of the sites; upon completion of the project, site leveling and afforestation are required.

5) Spoil yard

According to the –retaining before discarding" principle, retaining measures are arranged at the bottom of the spoil yard. Also the intercepting and drainage ditches are set in its surrounding area to ensure fluent drainage and reduce possibly loss of spoil. After spoiling, the top of site leveling on top of the spoil body and afforestation are required.

(4) Population health protection measures

To ensure the environmental health in the construction area, measures such as killing & disinfestation shall be taken in the construction camp, to lower down the density of various pathogenic microorganism and entomoplily in the construction area, prevent & control the prevalence of malaria & such infectious disease etc. and natural focal disease in the construction area.

Before mobilization, a sanitary cleaning should be implemented in the camp buildings and activity-dense places in construction area. Weeds, rubbish and solid waste should be cleared out. At least twice sanitary cleaning and disinfection shall be done every year during the construction.

Every construction unit and engineering management department should assign responsible persons for sanitary and epidemic prevention, to take charge of sanitary and epidemic prevention works within the management scope and be responsible for the publicity and education regarding construction safety and health for the construction personnel by means of broadcasting, wall newspaper and brochure etc., so as to enhance their awareness on disease prevention.

Health quarantine should be implemented before mobilization. No any infectious victim is allowed to join in the construction, so as to prevent cross-infection and prevalence of diseases. Health quarantine and period physical examination for construction personnel shall be done throughout the entire project.

Pay attention to the drinking water sanitation during the construction. Water directly taken from rivers can only be used after being disinfected and proving that it complies with the standard for drinking water sanitation. In addition, carry out periodic monitoring on water resource and drinking water as required, to prevent water-borne infection disease.

Pay attention to food sanitation during the construction. Carry out frequent food sanitation inspection and monitoring for various catering industries in the construction area, and all personnel engaged in the catering industry are only allowed to work after obtaining corresponding sanitary license.

Public health facilities should be reasonably allocated in the construction area. The vectors (such as mosquitoes, mice, flies etc.) should be regularly killed. It is advised to assign or employ professionals to take charge of the public health management, cleaning and disposal in the construction area of this project.

Medical center in the construction area must be provided with sufficient medicines for

preventing and curing malaria. In addition, medicines for preventing malaria must be given to the construction personnel periodically. Malaria patients should receive timely treatment.

For construction personnel working at the construction sites with high dust yield, dust prevention devices (such as dust respirator etc.) should be provided.

Shift system should be implemented for operators of concrete mixers, drivers of bulldozers and excavators, and workers of comprehensive processing plant.

(5) Air environment protection measures

Wet working method is preferred for drill-splitting, boring and blasting, and construction machinery equipped with dust collector should be used as practical as possible to reduce the dust generation. During the open blasting, straw bag shall be used to cover up the blasting surface as practical as possible, to reduce the dust generation.

Construction machinery and transport facilities under good working conditions should be adopted. Cement shall be kept under good sealing conditions by means of storage tank and sealed transport during the handling and transporting, to prevent dust pollution.

Lay greater emphasis on the management of large-size construction machinery and vehicles. Mechanical equipment shall be provided with corresponding smoke prevention and dust control facilities and vehicles shall be equipped with exhaust purifier.

Highway should be maintained periodically. The maintenance work should be enhanced especially for temporary road with mud stone pavement, to prevent pavement from breaking and dusting. Sprinkle water along highway except for rainy days, to reduce dust generation.

Carry out afforestation and landscaping works at both sides of the highway in combination with water and soil conservation measures, to reduce dust generation.

(6) Sound environment protection measures

According to the bidding contract, the construction unit should select construction machinery and tools under good working conditions, choose low-noise equipment and technology, pay attention to the equipment maintenance, make machines be lubricated properly, and lower down the working noise.

Mechanical equipment with heavy vibration shall use vibration-absorbing pedestal to lower down noise.

Working time should be reasonably arranged. Open blasting and comprehensive processing plant shall be stopped from 10:00pm to 7:00am, to lower down influence on the surrounding construction personnel.

Traffic sign or warning sign should be erected in sections where vehicles passing through living quarter and construction camp; running speed of vehicles should be limited in the construction area. Specify clearly on the guideboard that construction vehicles should not whistle in the daytime and must not whistle in the nighttime, to prevent affecting nearby residents and construction personnel.

Improve the automation level and realize long-distance monitoring for strong noise source, which can not only decrease the number of workers but also make workers stay away from the noise source.

During the construction, workers shall wear appliances for noise protection when entering into the working area of strong noise, i.e. rock drilling, boring, excavation and machine driving etc.

(7) Solid waste treatment

Garbage bins with different colors should be provided in the living area and the owner‘s

camps, which are used for collecting inorganic and organic wastes respectively. Waste cleaning and transporting vehicles should be provided and dustmen should be assigned for the cleaning and transporting of routine domestic waste. Inorganic waste (such as coal ash and demolition waste) should be dropped to the spoil yards near the dam site area and the power house site respectively to be landfilled and protected, and the afforestation of blanks should be recovered according to water and soil conservation measures for the spoil yards. Smoke-free incinerator can be adopted for treatment of organic domestic wastes.

After completion of the construction, the construction camps should be removed in time and the surrounding domestic waste, temporary toilets and cesspits should be cleaned up and leveled up, and carbolic acid and calcium lime should be used for disinfection.

The construction contractor should arrange full-time staff for collecting production waste. Assigned positions should be provided for piling up waste iron, rebar and wood fragments etc. Cluttering is prohibited.

During transportation, the construction materials should be covered to avoid falling along the way. The pavement of main road should be cleaned up regularly.

1.8.2Environmental management

It is proposed to establish an environmental protection management organization below Department of Construction of Chipwi Nge Hydropower Station and assign 1~2 full-time staff and several part-time staff, for purpose of realizing the unified leadership and organization of environmental protection works during the construction period.

Main duties and responsibilities of the above organization include: establishing the implementation planning and management method for environmental protection during construction period; compiling the annual work plan for environmental protection, including environmental protection investment plan; organizing the bid invitation for special work of environmental protection; supervising the implementation status of environmental protection measures of the contractor; supervising and inspecting the operation status of environmental protection measures related to the project; assisting the construction unit to deal with environment dispute related to the project and solve environmental pollution accidents; timely reporting to the superior or related management department; organizing the environmental supervision & monitoring works; periodically compiling and submitting the environmental quality report of the construction area; carrying out the publicity, education and training on environmental protection, and; compiling the environmental protection acceptance report etc. for project completion.

During the operation of Chipwi Nge Hydropower Station, the main contents of environmental management including the establishment of specialized environmental management agency,the implementation of the environmental mitigation measures and the establishment of environmental management and supervision system.

1.8.3 Environmental supervision

Main duties and responsibilities of the environmental supervisor are described as follows: review the construction organization plan, scheme, schedule, change order and application for commencement & completion etc. submitted by the construction unit in combination with the requirements on construction environment protection; and deliver detailed opinions on the environmental protection plan and measures drafted by the construction unit.

Supervise the implementation status of various environmental protection measures during the construction and issue the rectification order in case of violating the environmental protection requirement or causing adverse effect on the environment.

Supervise and check the self-inspection works of the construction unit with regard to environmental protection.

Properly compile and record the supervision log and keep its integrity and authenticity; establish the environmental supervision file and carry out the management of environmental protection results and data. Submit the monthly supervision report to the environmental management organization every month and submit the annual report and the final report every year.

Check and supervise the implementation status of environmental protection plan and measures during the operation period; pay attention to the supervision and inspection of operation status of ecological and environmental protection facilities; check and supervise the ecological and environmental monitoring work in the reservoir area and its downstream area, and; timely put forward the rectification requirement and adjustment opinion in case of any problem.

1.8.4Environmental monitoring

According to the project construction and the region environment characteristics, environmental monitoring for this project is determined in combination with the influence of construction on region environment, including: water environment, air environment, sound environment, terrestrial & aquatic ecology, water & soil conservation and population health etc.

1.8.5Environmental protection investment

According to the price level in the third quarter of 2007, investment for environmental protection is 20,844,500 Yuan, including 4,268,500 Yuan special investment for environmental protection and 16,576,000 Yuan special investment for water & soil conservation.

1.9 Conclusion

Overall assessment on environmental impact of Chipwi Nge Hydropower Station is as follows:

Main positive impacts: Chipwi Nge Hydropower Station is mainly developed for power generation, supplying construction power for near-term Myitsone and Chipwi Hydropower Stations in hydropower development of Ayeyawady River Basin above Myitkyina; and meanwhile, supplying electric power for commercial use to Kachin State as required besides the construction power, in order to mitigate the existing power shortage in the northern part of Myanmar, bring benefits to the local residents and promote the local socioeconomic development. This station will, upon its completion, provide sufficient electric power and energy to ChipwiTown Kachin State, change the status of long-term power shortage, improve the conditions of local electric power & traffic infrastructures, facilitate the production and livelihood of local people, provide facilities for poverty alleviation and well-off; and in addition, increase local fiscal revenue and promote sustainable development of regional social economy. Meanwhile, it will also play a very important role in the hydropower development of AyeyawadyRiver.

Main negative impacts: project construction, reservoir inundation, land occupation and dam blockage may affect the integrity of regional ecosystem, terrestrial animals and plants, aquatic lives etc. Construction of this project will intensify soil erosion of the construction area in a short period. In addition, waste water & gas, noise and spoil generated during the construction period may affect the surrounding environment and the health of construction personnel. However, those impacts are limited to the construction period and will gradually reduce or

disappear along with the completion of project and the implementation of environment protection measures.

The abovementioned negative impacts caused by project construction and operation can be minimized after taking corresponding measures of environmental protection as follows: water and soil conservation, ecologic environment protection, construction wastewater & sewage treatment, solid waste treatment, atmospheric environment protection and population health protection etc. Therefore, there are no restraining factor that may affect project construction in respect of environmental protection.

2 Generalrules

2.1 Assessment purpose

In the decision-making process of the project, our company gives due consideration to environmental problems related to Chipwi Nge Hydropower Station, andcoordinates the relationship between the construction of Chipwi Nge Hydropower Station and social & economic development as well as environmental protection of Kachin State so as to prevent and reduce the possible unfavorable environmental impact after the implementation of the project, and ensure the coordinate development of Chipwi Nge Hydropower Station and local ecological environment, society and economy.

2.2 Assessment principles

(1) Principle of sustainable development: natural resource is the material basis for human survival and development, and sustainable development is the highest criterion for the assessment of impact on ecological environment. As for the assessment of Chipwi Nge Hydropower Station‘s impact on the environment, it is required to assess the project construction‘s impact on terrestrial and aquatic biological resources as well as water resource from the perspective of the integrity of the ecological system so as to prevent the project from gravely affecting the sustainable development of the area.

(2) Principle of the harmonious development between human and nature: environmental protection is consistent with economic & social development in terms of the long-long and overall interest of Myanmar. However, they might be in conflict with each other sometimes from the short-term, regional perspectives. The assessment of the project‘s environmental impact should, on the basis of stressing long-term interest and overall interest, take into consideration short-term unfavorable impact and reduction measures.

(3) Principle of ecological protection: hydropower stations should be of non-pollution ecological damage. Assessment of environmental impact should aim to meet needs of biodiversity protection, water and soil conservation. The construction of hydropower stations should not lead to the extinction of any species, and not affect rare and endangered species whenever possible. If unavoidable, the corresponding protection measures should be brought forth.

(4) Principle of up-to-standard discharge: during operation, hydropower stations basically do not discharge toxic and harmful pollutants. Nevertheless, the discharge of ―three wastes" during construction can not be ignored. Pollutants should be controlled rigorously, and discharged up to standard.

(5) Principle of reasonable environmental protection measures: fully reveal environmental impact assessment‘s adjustment to the project construction, offer the basis for the comparison and selection of project design schemes from the angle of environmental protection, and optimize the selected design scheme. Environmental protection measures should be directed at specific problems and operable for the convenience of supervision and management by environmental administrations.

Besides, the assessment of environmental impact should also comply with basic principles such as science, objectiveness, fairness, and giving prominence to key points.

2.3 Project assessment types

Chipwi Nge Hydropower Station is an energy project of hydro-electrical power, which is the Type A project categorized by the Environmental Assessment Guideline by Asia Development Bank.

2.4 Assessment basis

The assessment of Chipwi Nge Hydropower Station's environmental impact is mainly based on technical guidelines and manuals of the World Bank, and refers to technical guidelines and standards of Asia Development Bank and China in the aspect.

2.4.1The World Bank's manuals and guidelines in the assessment of environmental impact

(1) The World Bank Operational Manual—*Environmental Assessment* (OP/BP/GP4.01)

(2) The World Bank Operational Manual—*Environmental Action Plan* (O P /BP 4.02)

(3) The World Bank Operational Manual—*Natural Habitat* (OP/BP/4.04)

(4) The World Bank Operational Manual—*Indigenous Peoples* (OP/BP4.10) ;

(5) The World Bank Operational Manual-*Natural Culture Resources* (OP /BP 4.11) ;

(6) The World Bank Operational Manual—*Involuntary Resettlement* (OP/BP4.12) ;

(7) The World Bank Operational Manual—*Forests* (OP/BP4.36)

(8) The World Bank Operational Manual—*Dam Safety* (OP/BP4.37)

(9) The World Bank Operational Manual—*Projects on International Rivers* (OP/BP7.50)

(10) The World Bank Operational Manual— *Information Disclosure* (OP/BP17.50)

(11) The World Bank*NGO Participation*(GP14.70)

(12) The World Bank *Social Assessment Guide*(1998)

(13) The World Bank Social Analysis Resource Manual (2002)

(14) The World Bank Pollution Prevention &Reduction ManualPollution Prevention and Abatement Handbook (1998)

And also Asian Development Bank's *Environmental Assessment Guideline* (2003), *Social Analysis Manual*, *Policies for Involuntary Resettlement*, and *Immigrant Manual*, and also China's technical guidelines concerning environmental impact assessment.

2.4.2Related laws, rules and policies of Myanmar

Environmental Protection Law of Myanmar(2012) ;

Water Resource & River Protection Law of Myanmar(2006);

Forestry Law of Myanmar;

Protection of Wildlife and Wild Plant and Conservation of Natural Areas Law of Myanmar(1994) ;

The Union of Myanmar Foreign Investment Law and Detailed Rules for the Implementation of The Union of Myanmar Foreign Investment Law;

Agenda and Environmental Policies of Myanmar in the 21st Century (1994).

2.4.3Technical documents

Planning Report of Hydropower Development in Nmaihka River, Malikha River and Myitsone of Ayeyawady River, Myanmar (CDC, December 2007);

Environmental Impact Report of Hydropower Development in Upper Reaches of Ayeyawady River (CDC, March 2010) ;

Special Research Report on Aquatic Organism Investigation &Assessment in the Upper Reaches of Ayeyawady River (Institute of Hydroecology, March 2010) ;

Special ResearchReport on Terrestrial Organism Investigation &Assessment in the Upper Reaches of Ayeyawady River (South China Botanical Garden, March 2010) ;

Report on the Assessment of Hydropower Development's Impact on Society and Immigrants in the Upper Reaches of Ayeyawady River(CDC, March 2010) ;

Investigation Report on Public Participation in Hydropower Development in the Upper Reaches of Ayeyawady River (CDC, March 2010) ;

Environmental Quality Status Investigation & Monitoring Results in the Upper Reaches of Ayeyawady River (Myanmar BANCA, 2009);

Feasibility Study Report of Chipwi Nge Hydropower Station (Construction Power Plant), Hydropower Project in Upper Reaches of Ayeyawady River (CDC, 2007);

2.5 Assessment scope

This engineering environmental impact assessment covers the hub engineering, reservoir area, and water-reduced river reach. Investigation and assessment scope of different environmental factors should be determined according to impact mechanism and impact degree. Considering the fact thatChipwi Nge Hydropower Station is located at Nmaihka River, and its tail water basically does not affect the water environment and aquatic ecology of the River, the assessment of Chipwi Nge Hydropower Station's impacts on hydrological regime, water environment, and aquatic ecology is only limited to the mouth of Chipwi River. See Table 2.5-1 for the assessment scope of each environmental factor.

Table 2.5-1 Scope of Environmental Impact Assessment of Chipwi Nge Hydropower Station

Environmental factor	Assessment scope
Hydrological regime	From the end of reservoir of Chipwi Nge Hydropower Station to the mouth of Chipwi River, plant tail water involving Nmaihka River section
Water environment	From the end of reservoir of Chipwi Nge Hydropower Station to the mouth of Chipwi River, plant tail water involving Nmaihka River section
Atmospheric environment	Construction management area extends 2km both to the upstream and downstream of the river valley.
Acoustic environment	Construction management area and 200m around the boundary of construction management area
Terrestrial ecology	From the end of reservoir of Chipwi Nge Hydropower Station to the area below Grade I watershed at the two sides of the mouth of Chipwi River, and 500m around the plant
Aquatic organism	From the end of reservoir of Chipwi Nge Hydropower Station to the area below Grade I watershed at the two sides of the mouth of Chipwi River, plant tail water involving Nmaihka River section
Social environment	Kachin State

2.6 Goals of environmental protection

(1) Coordinate the relationship between the construction of Chipwi Nge Hydropower Station and regional environmental protection, economic and social development, and facilitate the sustainable development of the regional economy.

(2) Reasonably develop water resources of ChipwiRiver, and minimize the unfavorable

impact caused by changes of hydrological regime.

(3) Keep the current water quality of ChipwiRiver so as to make the water quality not decline due to the project during the construction of the project and after the operation of the project.

(4) Relieve possible unfavorable impacts on rare and endangered wild animals and plants by hydropower development within the assessment scope; and relieve possible unfavorable impacts on aquatic organism by hydropower development.

(5) Reserve forests and farmlands, reduce farmland loss whenever possible, protect forest vegetation, restore the vegetation of lands occupied by construction temporarily, and reduce possible unfavorable impacts on drainage landscape and ecological environment by project construction.

(6) Guarantee the health of construction personnel, and avoid the spreading of infectious diseases and local diseases in the construction area during the construction period.

2.7 Working procedures of environmental impact evaluation

The compilation of this environmental impact assessment report is mainly divided into the following two stages.

(1) Compilation and consultation of the guideline for the environmental impact evaluation

Conduct the preliminary engineering analysis on the design scheme of Chipwi Nge Hydropower Station, select key assessment factors and coefficients, determine the assessment and content of each environmental factor, and clarify work organizations and work divisions.

(2) Compilation of environmental impact report

Based on the existing data, carry out the forecast assessment of the impact on regional ecological environment and social environment by the development of Chipwi Nge Hydropower Station, formulate the corresponding environmental protection countermeasures and abatement measures, bring forth environmental monitoring and management plan, formulate the *Environmental Impact Report of Chipwi Nge Hydropower Station (Construction Power Plant), Hydropower Project in Upper Reaches of Ayeyawady River*, and submitit to CPIYN

2.8 Overview of the finished works

CDC and its partners have finished the following works:

(1) Environmental Impact Report of Hydropower Development in Upper Reaches of AyeyawadyRiver

In March 2010, CDC finished the compilation of *Environmental Impact Report of Hydropower Development in Upper Reaches of Ayeyawady River*, which is composed of Chapter I Foreword; Chapter II Project Overview & Analysis; Chapter III Environmental Status Investigation & Analysis; Chapter IV Environmental Impact Identification; Chapter V Environmental Impact Forecast & Analysis; Chapter V Social Impact Forecast & Assessment; Chapter VII Typical Hydropower Station Environmental Impact Analysis; Chapter VIII Environmental Impact Abatement Measures; Chapter IX Environmental Impact Economic Analysis; Chapter X Public Participation; Chapter XI Environmental Management Plan; and Chapter XII Assessment Conclusions & Suggestions.

(2) Special Research Report on Aquatic Organism Investigation &Assessment in the Upper Reaches of AyeyawadyRiver

The undertaker of the special research report is Institute of Hydroecology, MWR & CAS.

From January to May 2009, Institute of Hydroecology, together with aquatic organism experts of Myanmar, conducted the in-depth research into the status quo of aquatic ecological system in the upper reaches of Ayeyawady River**,** and obtained the first-hand data.

(3) Special Research Report on Terrestrial Organism Investigation &Assessment in the Upper Reaches of AyeyawadyRiver

The undertaker of the special research report is SouthChinaBotanical Garden and South China Endangered Animal Research Institute. From January to May 2009, Institute of Hydroecology, together with terrestrial organism experts of Myanmar, conducted the in-depth research into the status quo of aquatic ecological system in the upper reaches of Ayeyawady River**,** and obtained the first-hand data.

(4) Environmental Quality Status Investigation & Monitoring Results in the Upper Reaches of AyeyawadyRiver

Entrusted by CPIYN, Biodiversity And Nature Conservation Association (BANCA) undertook the monitoring and investigation of environmental quality status of hydropower development in the Upper Reaches of Ayeyawady River.

(5) Report on the Assessment of Hydropower Development's Impact on Society and Immigrants in the Upper Reaches of Ayeyawady River

In March 2010, CDC, based on site investigation and collected data, compiled *Report on the Assessment of Hydropower Development's Impact on Society and Immigrants in the Upper Reaches of Ayeyawady River*. The report is composed of nine chapters, and makes emphatic analysis on the impact on immigrants, society and economy by hydropower development in AyeyawadyRiver.

(6) Investigation Report on Public Participation in Hydropower Development in the Upper Reaches of AyeyawadyRiver

In March 2010, CDC, based on the results of questionnaires, compiled the *Investigation Report on Public Participation in Hydropower Development in the Upper Reaches of Ayeyawady River*, analyzed local people's wills and suggestions, and reflected their key concerns to the main designer and the owner.

(7) Result of design stage of Chipwi Nge Hydropower Station

The feasibility study report and bidding design report of Chipwi Nge Hydropower Station include chapters concerning environmental impact assessment and environmental protection design, which systematically elaborate on Chipwi Nge Hydropower Station's favorable and unfavorable impacts on social environment and ecological environment, and formulate the corresponding highly operable environmental protection measures.

3Laws and regulations of Myanmar

3.1 Environmental policies of Myanmar

To reasonably develop water, land, forest, mineral and ocean resources and also other natural resources, and avoid the degrading of natural environment and ecological environment, federal government of Myanmar promulgated *Agenda and Environmental Policies of Myanmar in the 21st Century* on December 5, 1994. The policy stipulates that: ―People, cultural heritage, environment and natural resources are the first wealth of the country. Our environmental policy is aimed at considering the possible environmental impact during the development and realizing the harmony and balance between economic development and environmental protection, so as to improve the life quality of our people. Each country has its sovereignty to use natural resources in compliance with its environmental policy but must be careful to not exceed its jurisdictional limits or infringe the interests of other countries during the development of natural resources. The country and every citizen have the liability to protect the current and future natural resources and should always deem environmental protection as the key target during the development process."

3.2 Environmental protection law of Myanmar

Myanmar promulgated the *Environmental Protection Law* on March 30th 2012, which was passed by the federal congress and signed by the president U Thein Sein. The law is composed of 42 articles in 14 chapters, including purpose of environmental protection law, responsibilities of environmental protection department, environmental quality standard, environmental protection, urban environment management, reservation of natural resources and cultural relics, project implementation license, and punishment.

Its Chapter IX reservation of natural resources and cultural relics requires: related departments should comply with stipulations of the federal government and commission when protecting, managing, effectively using forest resource, land resource, water resource, mineral resource, agricultural resource, ocean resource, and aquatic resource.

Its Chapter X implementation license requires: to obtain advanced licenses, enterprise owners should offer project license applications to the environmental protection department according to stipulations; the environmental protection department can decide whether to issue advanced licenses after examination; when issuing advanced licenses, the environmental protection department can make stipulations on environmental protection, which are regarded as the basis of supervision of other governmental departments and organizations; if discovering an applicant fails to follow environmental protection stipulations in advanced license, the environmental protection department can warn or punish the applicant.

Its Chapter XII clearly points out that projects requiring advanced license can not start construction until they are licensed.

3.3Myanmar's laws and regulations related to environmental protection

According to collected data, Myanmar's laws and regulations related to environmental protection are as follows:

(1) Forestry Law of Myanmar (1992)

(2)Wildlife and Natural Area Protection Law (1994)

(3)Water Resources and River Protection Law(2006)

(4)Mineral Resource Law (1994)

(5) Fresh Water Fishery Lawof Myanmar(1991)

(6)Marine Fishery Law of Myanmar (1990)

Forestry Law of Myanmar and*Wildlife and Natural Area Protection Law* aim to manage forests in a sustainable way and maintain the biological diversity in a sustainable way, and reinforce forest law enforcement and harnessing. *Fresh Water Fishery Law of Myanmar*and *Marine Fishery Law of Myanmar* aim to develop the fishing industry, avoid fish extinction, maintain and prevent environmental deterioration, and ensure the sustainable development. *Mineral Resource Law*makes some stipulations on environmental protection (especially gold mine exploitation‘s unfavorable impacts on environmental protection), and also restrictions on the holder of mining license, prohibiting any activities that may have unfavorable impacts on the public.

However, the situation is complicated within the boundary of Kachin state, including policies, law enforcement and harnessing. Apparently, the state government controls all aspects of Kachin state,, including forest resource and mineral resource. However, most of forests and mines are actually in the hands of local armed groups, which reach peaceful agreements with the federal government.

3.4International conventions signed by Myanmar

International conventions and agreements signed by Myanmar are shown as Table 3.4-1.

Table 3.4-1 Schedule of International Conventions and Agreements Signed by Myanmar

Chinese name	Title	Time approval
东南亚及太平洋地区植物保护协议，罗马，1956 年	Plant Protection Agreement for the South-East Asia and the Pacific Region, Rome, 1956	4-11-1959 (Adherence)
防止船舶污染国际公约，伦敦，1973 年	International Convention for the Prevention of Pollution from Ships, London, 1973	(Accession)
国际防止船舶造成污染公约的 1978 年议定书，伦敦，1973	Protocol of 1978 Relating to the International Convention for the Prevention of Pollution from Ships, London, 1973	4-8-1988 (Accession)
联合国气候变化框架公约，纽约，1992 年 (UNFCCC)	United Nations Framework Convention on Climate Change, New York, 1992 (UNFCCC)	25-11-1994 (Ratification)
生物多样性公约，里约热内卢，1992 年	Convention on Biological Diversity, Rio de Janeiro, 1992	25-11-1994 (Ratification)
国际热带木材协定 (ITTA)，日内瓦，1994 年	International Tropical Timber Agreement (ITTA), Geneva,1994	31-1-1996 (Ratification)
保护臭氧层维也纳公约，维也纳，1985 年	Vienna Convention for the Protection of the Ozone Layer, Vienna, 1985	24-11-1993 (Ratification)
关于消耗臭氧气层物质蒙特利尔协议，蒙特利尔，1987 年	Montreal Protocol on Substances that Deplete the Ozone Layer, Montreal, 1987	24-11-1993 (Ratification)
对关于消耗臭氧层物质的蒙特利尔议定书伦敦修正案，伦敦，1990 年	London Amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer, London, 1990	24-11-1993 (Ratification)
保护世界文化和自然遗产公约，巴黎，1972 年	The Convention for the Protection of the World Culture and Natural Heritage, Paris, 1972	29-4-1994 (Acceptance)
亚洲及太平洋区水产养殖中心网络协议，曼谷，1988 年	Agreement on the Networks of Aquaculture Centres in Asia and the Pacific, Bangkok, 1988	22-5-1990 (Accession)
联合国关于在发生严重干旱和/或荒漠化的国家特别是在非洲防治荒漠化公约，巴黎，1994 年 (UNCCD)	United Nations Convention to Combat Desertification in Those Countries Experiencing Serious Drought and/ or Desertification, Particularly in Africa, Paris, 1994 (UNCCD)	2-1-1997 (Accession)
野生动植物濒危物种的国际贸易公约，华盛顿，D.C.，1973 年;和此公约在波恩的经修订公约，德国，1979 年 (CITIES)	Convention on International Trade in Endangered Species of Wild Fauna and Flora, Washington, D.C., 1973; and this convention as amended in Bonn, Germany, 1979 (CITES)	13-6-1997 (Accession)
促进遵守公海捕鱼船保育与管理措施协定，罗马，1973 年	Agreement to Promote Compliance with International Conservation and Management Measures by Fishing Vessels on the High Seas, Rome, 1973	8-9-1994 (Acceptance)
东南亚国家保护自然与自然资源协定，吉隆坡，1985 年	ASEAN Agreement on the Conservation of Nature and Nature Resources, Kuala Lumpur, 1985	
生物安全议定书，哥伦比亚港口卡塔荷娜，2000 年	Catagena Protocol on Biosafety, Cartagena, 2000	
东盟跨疆界烟霾协议	ASEAN Agreement on Transboundary Haze Pollution	13-3-2003 (Ratification)
粮食和农业植物遗传资源国际条约，2001 年	International Treaty on Plant Genetic Resources for Food and Agriculture, 2001	4-12-2004 (Ratification)
京都议定书，京都，1997 年	Kyoto Protocol to the Convention on Climate Change, Kyoto,1997	13-8-2003 (Accession)
东盟遗产公园宣言	Declaration on ASEAN Heritage Parks	
关于持久性有机污染物的斯德哥尔摩公约 (POP)，2001 年	Stockholm Convention on Persistent Organic Pollutants (POPs), 2001	18-4-2004 (Accession)
关于特别是作为水禽栖息地的国际重要湿地公约，1971 年颁布，1982 年与 1987 年修订	The Ramsar Convention on Wetlands of International Importance especially as Waterfowl Habitat, 1971 as amended in 1982 and 1987	8-11-2004 (Accession)
生物多样性的东盟区域中心确立	Establishment of ASEAN Regional Centre for Biodiversity	

4Project overview

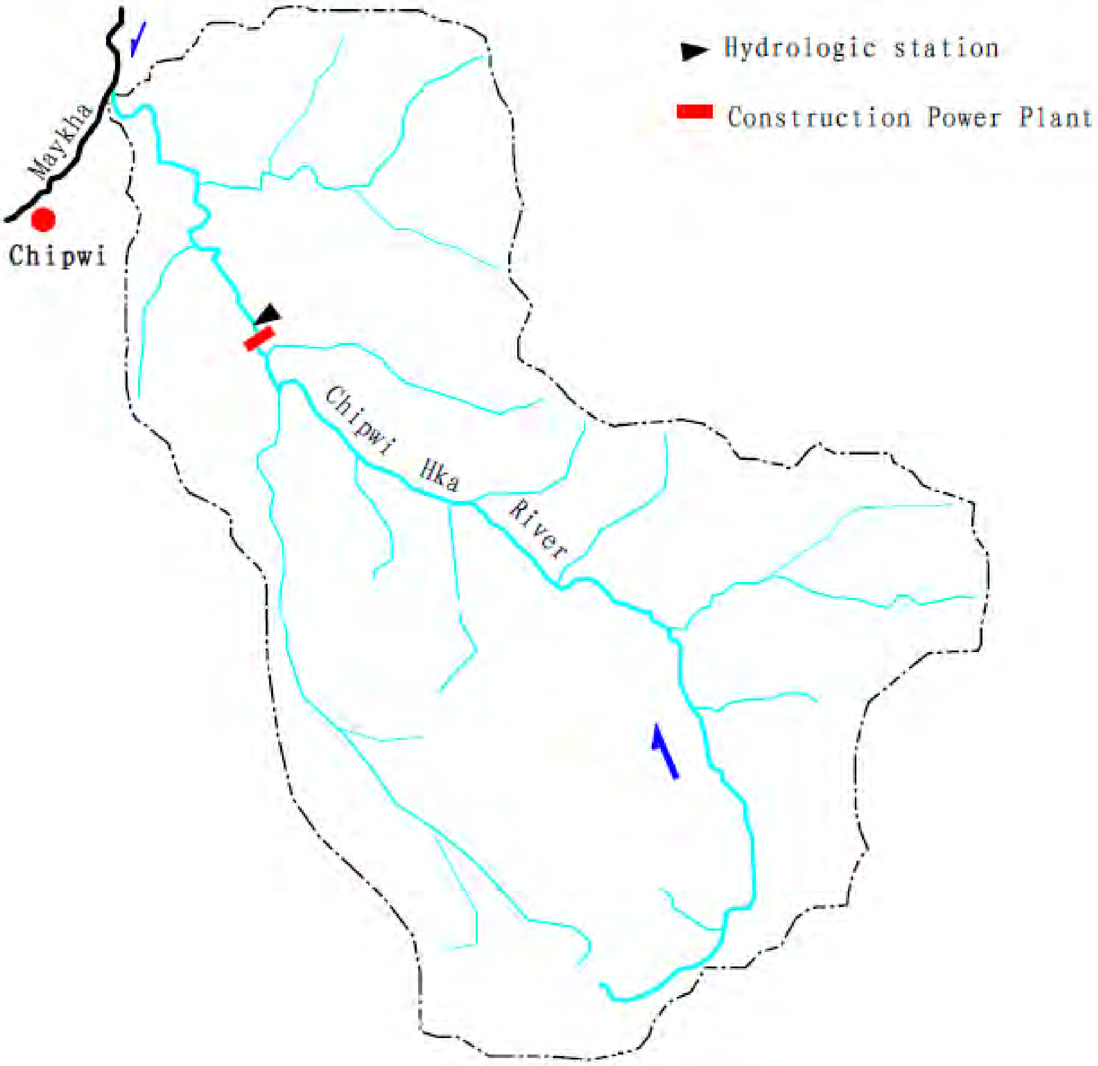
4.1 Drainage basin planning, development and utilization

4.1.1Drainage basin overview

NmaihkaRiver originates from the southwest foot of BoshulaMountains in the boundary of Zayu County, Tibet, China, and flows into Myanmar from Maku of Gongshan County, Yunnan Province, and converges with MalikhaRiver at Myitsone which is about 45km north of Kachin Myitkyina.And then, it is called AyeyawadyRiver, and also the major source of the river. NmaihkaRiver is 353km in length, 24,200km^2 (including 4,200km^2 in the Chinese boundary) in drainage area, and 1,010m in natural head.

Chipwi River is a tributary on the left bank of Nmaihka River, and the geographical coordinate is eastern longitude 98°8′～98°28′ and northern latitude 25°30′～25°52′. It originates from GaoligongMountain at the boundary of China and Myanmar, flows from southeast to northwest, and converges with NmaihkaRiver close to ChipwiTown. ChipwiRiver is 743.6km^2 in drainage area, 58.0km in length, 3,000m in natural head, and 52‰ in gradient. Average annual discharge is 54.0m^3/s.

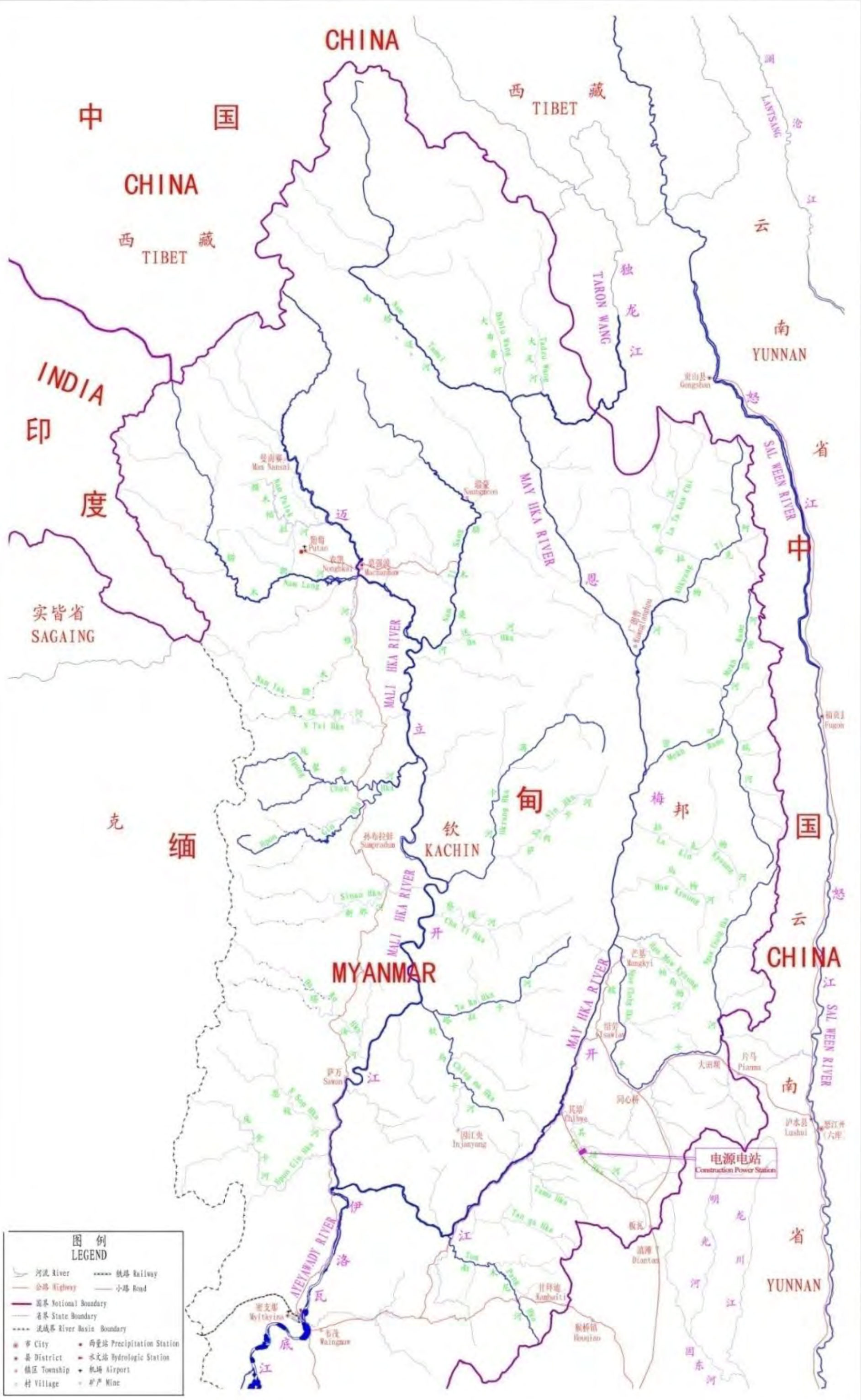
The dam of Chipwi Nge Hydropower Station is planned to be located about 15km away from the river mouth. Riverbed elevation there is about 710m, control catchment above the dam 552.3km^2, river length42.1km, and gradient 54‰.



Firgure1 Schematic map of river systems of Chipwi Hka River

附图2 电源电站水系图

FIGURE 2 DRAINAGE MAP OF CONSTRUCTION POWER PLANT



4.1.2Hydropower planning in the drainage basin

AyeyawadyRiver basin above Myitkyina owes abundant water resources, which has relatively valuable development. In recent years, with the demand of social and economic development, Myanmar government lists hydropower development as the national priority, and at the same time, transforms its advantage of resources into economic advantage. According to the geological location and the condition of hydropower resources, Myanmar government plans to focus on developing hydropower resources in AyeyawadyRiver basin above Myitkyina.

In December2006, Ministry of Electric Power No. 1, Myanmar (MOEP 1) and China Power Investment Corporation (CPI) signed the *Memorandum of Understanding on Hydropower Projects in NmaihkaRiver, MalikhaRiver and Chipwi Nge of Ayeyawady River, Myanmar*. Entrusted by CPI, CDC formulated the *Planning Report of Hydropower Development in NmaihkaRiver, MalihkaRiver and Chipwi Nge Hydropower Station of Ayeyawady River, Myanmar*in December 2007. In October 2009, CDC formulated *Feasibility Study Report of Chipwi Nge Hydropower Station in Upper Reaches of Ayeyawady River*.

According to the characteristics of Ayeyawady River basin above Myitkyina and the requirement of the national economy of Myanmar on river development, the mission of the planned drainage basin development is power generation while controlling flood and improving shipping along the lower reaches and irrigation conditions. The plan recommends scheme I for the Cascade Development of Ayeyawady River basin above Myitkyina after analyzing and comparing the comprehensive utilization profits, engineering technical condition and engineering economic indexes, namely:

Enmaynua River, Ayeyawady River: Yenan(1010m)—Kaunglanhpur(875m)—Pisa(665m)—Wutsok(525m)—Chipwi(400m)—Myitsone(245m)

Malinka River: Laza (370m)

The recommended scheme for the cascade development of AyeyawadyRiver basin above Myitkyina is of 18400MW total installed capacity and 99.11 billion kW-h annual energy output.

According toMOA agreement, Myanmar, it is planned to spend 15 years on developing this valley cascade power station. according to the development condition, pre-phase work foundation and the cascade power station profit, the power stations of Myistone and Chipwi are listed as recent projects to be developed, Wutsok, Pisa, Kaunglanhpur and Laza power stations, which have relatively good development condition and economic indexes, are listed as the second batch of projects to be development, and Yenan power station the third batch.

4.2 Necessity of project construction

(1) The need of water resource development in the drainage basin

AyeyawadyRiver basin above Myitkyina is not covered by state grid of Myanmar, and gravely runs short of power supply. In addition, the state grid of Myanmar can not supply enough power, and frequently breaks down, so it can not offer construction power for the development of hydropower resources in AyeyawadyRiver basin above Myitkyina. To ensure the smooth implementation of the development of hydropower resources in Ayeyawady River basin above Myitkyina, and guarantee construction safety, it is planned to build Chipwi Nge Hydropower Station first, which features short transmission distance and good economic indexes, and is able to provide electric power for both power stations at Myistone and Chipwi. Therefore, it is extremely necessary to build Chipwi Nge Hydropower Station in the early

stage.

(2) The need of social and economic development

Chipwi Nge Hydropower Station is located in the boundary of KachinState at the north of Myanmar, where boasts rich natural resources but is short of necessary capital, technology and equipment. Therefore, such resources are poorly developed and utilized. The construction of Chipwi Nge Hydropower Station can improve local traffic conditions, and is important for developing local resources, improving local economy and local people‘s living level.

(3) The concrete measure of strengthening the long-term strategic partnership between China and Myanmar

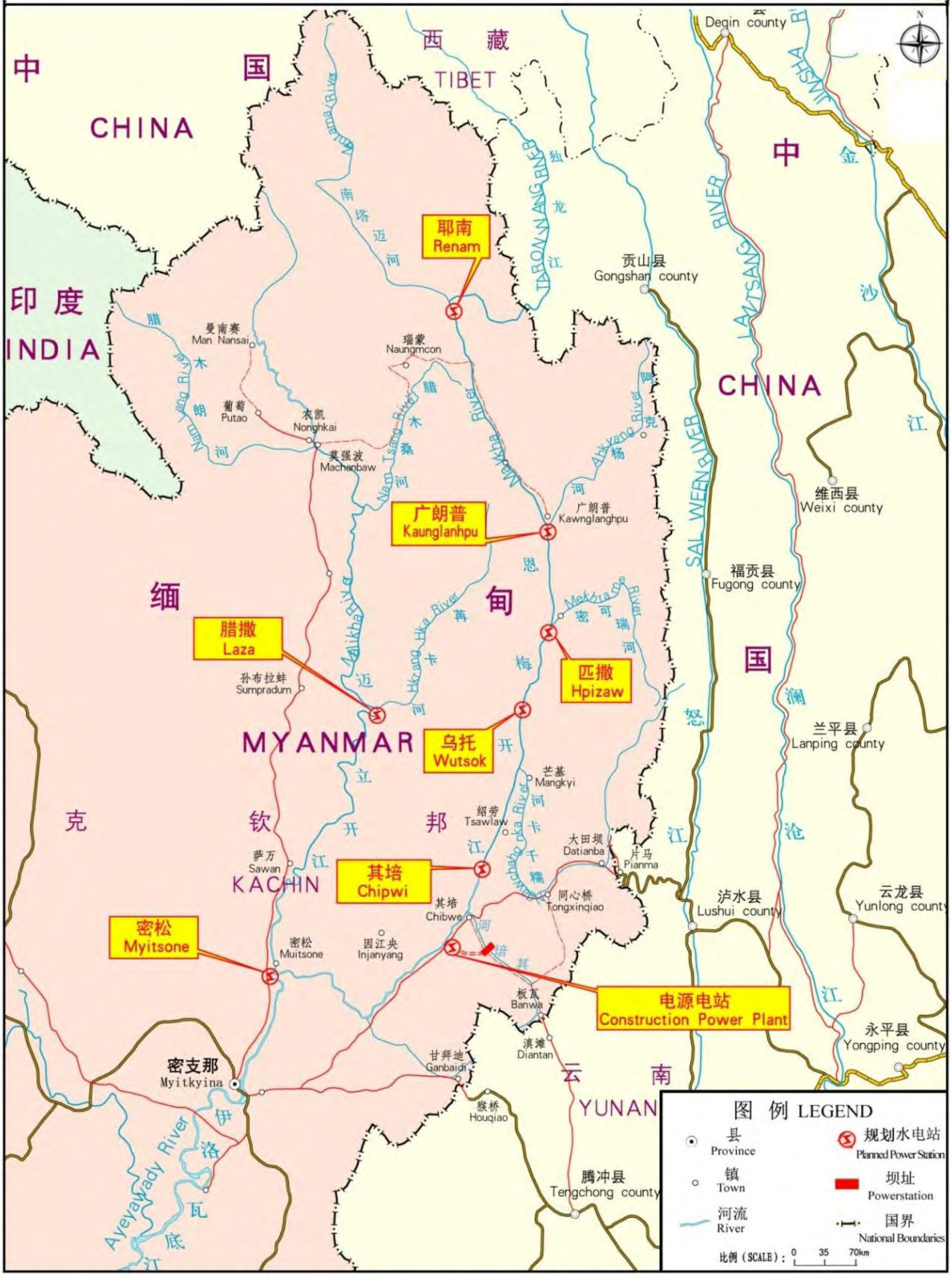
Developing hydropower resource in AyeyawadyRiver basin above Myitkyina is a win-win strategic project between China and Myanmar, the need of mutual benefit and common development of both countries, and also the need of maintaining and developing their long-term strategic partnership. The construction of Chipwi Nge Hydropower Station symbolizes the formal start of the development of hydropower resource in AyeyawadyRiver basin above Myitkyina, and also the concrete action of reinforcing the long-term strategic partnership between China and Myanmar.

4.3 Geographical location of the project

The dam of Chipwi Nge Hydropower Station is located on Chipwi River, a tributary on the left bank of Nmaihka River, in the straight river valley about 1.5km～2.0km at the upstream of Labang Bridge, about 15km away from Chipwi Town; the plant is on the left bank of NmaihkaRiver, about 9km away from the upstream ChipwiTown, about 62km away from the downstream Myistone Hydropower Station, and about 20km away from the upstream Chipwi Hydropower Station.

附图1 电源电站地理位置示意图

FIGURE 1 SKETCH MAP OF GEOGRAPHY POSITION OF CONSTRUCTION POWER PLANT



4.4 Project development task, scale and operating way

4.4.1 Project development task

According to the need of the development of water resources in AyeyawadyRiver basin above Myitkyina and also the actual situation of ChipwiRiver, the development task of the project is determined to be power generation, offering construction power to recent Myistone and Chipwi hydropower stations for the development of water resources in AyeyawadyRiver basin above Myitkyina. At present, due to changes of external conditions, the project task of Chipwi Nge Hydropower Station is to supply power to ChipwiTown and MyitkyinaCity.

Normal pool level of Chipwi Nge Station is 740m, and regulation storage 281,000m^3, with daily regulating capacity. The installed capacity of the power station is 99MW, guaranteed output 25.9MW (P＝90%), and average annual generating capacity 599 million kW·h. The runoff of ChipwiRiver is changing frequently, and allocation in a year is uneven. If water shortage happens in the peak construction period of Myistone and Chipwi hydropower stations, and there is a short supply of power, the power for the construction of Chipwi Hydropower Station can be guaranteed first. The power inadequacy of Myistone Hydropower Station can be solved through other means (such as self-prepared diesel generator).

4.4.2 Project scale and major features

Normal pool level of Chipwi Nge Station is 740m, maximum flood level 745.99 m, and corresponding reservoir capacities 789,000m^3 and 1,234,000m^3 separately. The installed capacity of the power station is 99MW, and average annual generating capacity 599 million kW·h. According to *Flood Control Standard* (GB50201-94) and *Classification & Design Safety Standard of Hydropower Projects*(DL5180-2003), the project is a medium Grade III project, major buildings such as dam and diversion power generation system are of Grade III, secondary buildings of Grade IV, and temporary buildings of Grade V. Hydraulic structures are of Grade II security.

Engineering features are shown as Table 4.4-1.

Table 4.4-1 Engineering Features of Chipwi Nge Hydropower Station

No. and name	Unit	Qty. or feature	Remarks
I. Hydrology			
1 Control catchment area above the dam	km^2	552.3	
2 Average annual runoff	100 million m^3	12.6	
3 Dam representative runoff			
Average annual runoff	m^3/s	40.1	
Designed flood runoff	m^3/s	1710	P=2%
Maximum flood runoff	m^3/s	2540	P=0.2%
II. Reservoir			
Maximum flood level	m	745.99	P=0.2%
Designed flood level	m	744.26	P=2%
Normal pool level	m	740.00	
Dead water level for power generation	m	735.00	
Total storage	10,000m^3	123.4	
Regulation storage	10,000m^3	28.1	
III. Performance indicators			
Installed capacity	MW	99	
Guaranteed output (P=90%)	MW	25.9	
Average annual power output	100 million kW·h	5.99	
Annual utilization hours	h	6050	
III. Inundated area and permanent land occupation			

Table 4.4-1 Engineering Features of Chipwi Nge Hydropower Station (continued)

No. and name	Unit	Qty. or feature	Remarks
Inundated area	hm^2	8.1	
Permanent land occupation	hm^2	7.6	
V. Major buildings and equipment			
Project grade and major building grade		Grade III	
1 water retaining structure			
Type		Concrete gravity dam	
Foundation feature		Diorite granite gneiss	
Seismic basic intensity/design intensity	Grade	Ⅷ/Ⅷ	
Crest elevation	m	747.5	
Maximum dam height	m	47.5	
Dam crest length	m	220.0	
2 Gate-free overflow surface outlet			
Outlet number	Outlet	5	
Single outlet width	m	13	
Maximum discharge flow	m^3/s	1942	
Generator model		SF33-16/3250	
Stand-alone diversion flow	m^3/s	8.82	
Rated head of unit	m	433	
Maximum head	m	483	
Minimum head	m	431	
Unit total capacity	MW	99	
Unit number	Pcs	3	
Transformer type		S10-40000/121±2×2.5%/10.5	
Transmission line voltage grade	kV	110	
VI. Project construction			
1 Quantities of major works			
(1) Earth work excavation	$10,000m^3$	104.97	
(2) Earth work backfilling	$10,000m^3$	10.73	
(3) Concrete placement	$10,000m^3$	17.8	
(4) Reinforcement	t	4180	
(5) Installation of metal structures	t	3551	
2 External traffic	km	111	
3 Construction diversion way		Tunnel diversion	Section size 3m×4m
4 Overall construction period	Month	32	
Generation period of the first unit	Month	28	
VII. Static total investment	RMB 100 million Yuan	11.19	RMB

4.4.3 Project operating mode

Chipwi Nge Hydropower Station is mainly to provide construction power for Myitsone Hydropower Station and Chipwi Hydropower Station, being a daily adjustment power station. Its daily operating mode should be adjusted moderately according to the demand of the electric power system. When the daily average output is smaller than the installed capacity, the reservoir will perform daily regulating. When the daily average output reaches the installed capacity, the station is operated under base load.

The operation mode of flood discharge and sand removal for the flood releasing structure shall comply with the original design scheme. Barrage of the power station locates on Chipwi River – a first-grade tributary of the Nmai Hka River, where the river channel has the natural longitudinal gradient up to 54‰ and has distinct characteristics of mountain storm flood in flood season, i.e. high flow, short runoff generation time, numerous surface floating objects and high content of sediments etc. –Open" type flood discharge shall be adopted. Meanwhile, to protect the intake of water conveyance structure against sediment blocking, sediment flushing outlet for flood discharge shall be used at the beginning and the end of flood season each year for sand removal. Detailed application is explained as follows:

(1) When the water inflow reaches about $80m^3/s$ at the beginning and the end of flood season each year, the sediment flushing outlet for flood discharge must be used for one operation of sand removal.

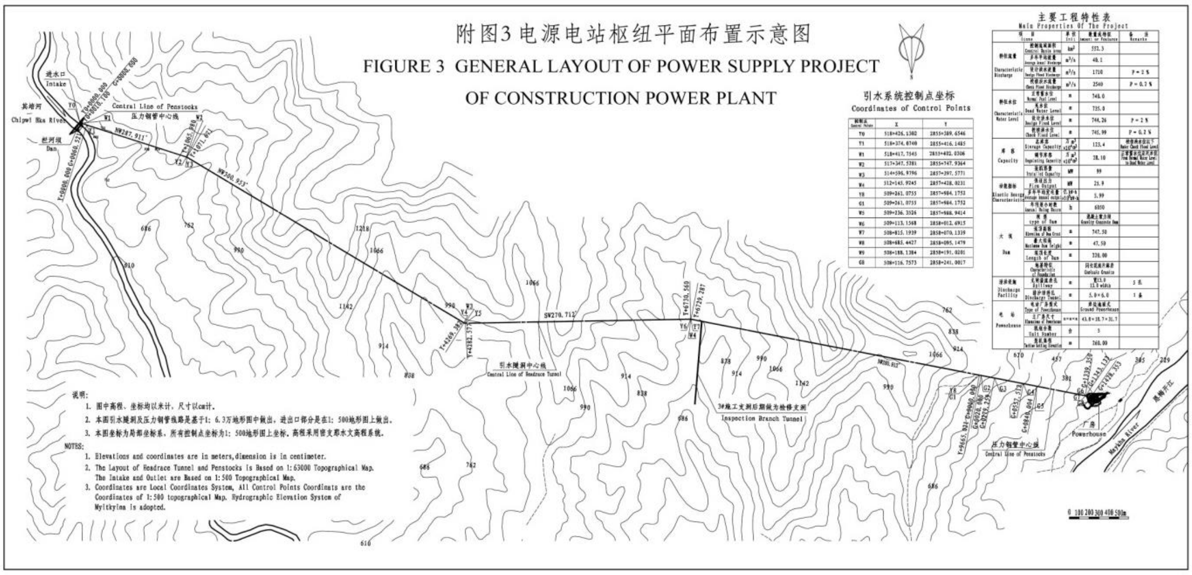
(2) The sediment flushing outlet for flood discharge shall be put into operation when the discharge flow of the complex reaches $170m^3/s$, then closed when the reservoir level is down to 735m and started again when the discharge flow reaches $170m^3/s$. Repeat the foresaid procedure and carry out the sand removal.

(3) With regard to the relatively numerous floating objects and serious silting in the reservoir at present, they are mainly caused by construction wastes in the upper reaches. Before impoundment and power generation, the sediment flushing outlet for flood discharge shall be put into operation and dredging & excavation work shall be done if necessary, to reserve a sufficiently effective capacity of the reservoir.

4.5Project junction layout and major buildings

Chipwi Nge Hydropower Station is a diversion-type power station, and the hub building is mainly composed of dam, diversion system, diversion building and plant.

The recommended hub arrangement of Chipwi Nge Hydropower Station is: the dam and power station water intake are located on Chipwi, and the dam is a concrete gravity dam. Dam water intake is adopted, and diversion route is a broken line. Internal diameter of tunnel is 4.0m; the plant and tail water channel are located at the left bank of NmaihkaRiver, and the plant is an open plant. The plant axis forms a 30° angle with pressure steel pipes.



(1) Dam

Dam axis is the up dam line, and dam type is the normal concrete gravity dam. The crest elevation is 747.5m, maximum dam height 47.5m, and crest length220m. The dam is composed of non-overflow dam section and overflow dam section. Overflow dam section, 86m long, is arranged on the riverbed. It is provided with five-hole open gate-free control downflow weir, with the weir top elevation being 740.0m, single-hole downflow weir width 13m, and overall net width of downflow front edge 65m. The non-overflow dam at the left bank is 62.5m long, and that at the right bank is 71.5m long.

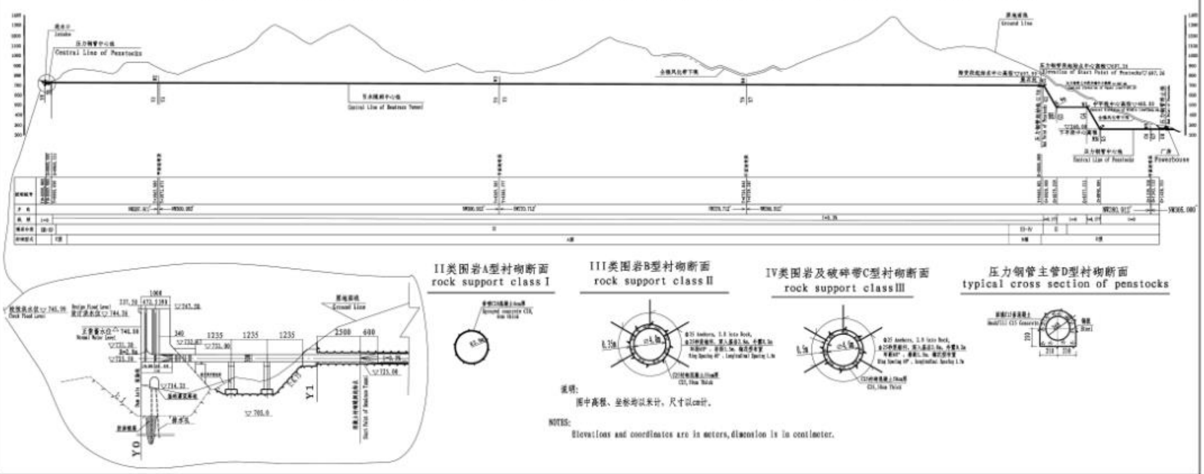
Flood discharge sediment flushing outlets with opening size being 5m×6m are arranged in the left overflow dam section. Its bottom elevation is 715.0m. Close to the right side of flood discharge sediment flushing outlets are ecological flow drainage holes, which are of round-pipe type, internal diameter D=20cm, and central elevation 720.0m. The central line is 1.5m away from the right wall of flood discharge sediment flushing outlets. Surface downflow weir and flood discharge sediment flushing outlet are of flip trajectory bucket.

(2) Water diversion system for power generation

Power generation water diversion system is composed of water intake, pressure diversion tunnel and pressure steel pipe. Water intake is dam-type water intake, with bottom elevation being 725.50m. It is designed with a trash rackand an accident bulkhead gate. Diversion tunnel is of round section, with internal diameter being 4.0m and tunnel length 9,665m. There is a stone pit at the end of the tunnel, which is connected with pressure steel pipe through transition section. Pressure steel pipe is buried underground, and pipe diameter is 2.6m. Pressure steel pipe is divided into upper level section, upper inclined section, middle level

section, lower inclined section, and lower level section. After going out of the mountain, the lower level section forms an open pipe, and is divided into three branch pipes of 1.4m in diameter to get access to the plant. The central elevation of the upper level section is 697.20m, that of the middle level section 480.00m, and that of lower level section 260.00m. Axial length of pressure steel pipe in mountain is about 1,428m.

附图4 电源电站引水系统纵剖面图
FIGURE 4 LONGITUDINAL PROFILE OF HEADRACE TUNNEL OF CONSTRUCTION POWER PLANT



(3) Diversion works

Diversion structures mainly include diversion tunnel and cofferdam. Diversion tunnel is located at the left bank, and the section is like a city gate opening. The cross section dimension is 3m (width) ×4m (height). Inlet bottom elevation 713.0m, outlet bottom elevation 705.0m, and tunnel length264.42m. Both upstream, and downstream cofferdams are earth-rock cofferdams. Upstream cofferdam axis is 86.3m long, cofferdam crest elevation 724.0m, crest width 6m, and maximum cofferdam height about 12.0m. Downstream cofferdam axis is 97.8m long, cofferdam crest elevation 708.0m, crest width 6m, and maximum cofferdam height about 13.0m.

(4) Plant

The plant is ground plant. Buildings in the plant area include the main plant, installation yard, auxiliary plant, tail water channel, permanent electromechanical warehouse. Installation yard is arranged at the right side of the main plant. Auxiliary plant is arranged at the upstream of the main plant and installation yard. The lane of the access road to the plant is 6m in net width, and firefighting channel in the site is 6m in net width. Three sets of vertical impact water turbine generators are provided in total, with single installed capacity being 33MW. 110kV Grade I voltage, in isolated network operation, is adopted to supply power to construction substations of Myitsone and Chipwi. The power station has three loops of 110kV outgoing lines, one to the construction substation of Chipwi, one to the construction substation of Myitsone, and another for standby (reserved for Waxiao).

According to the Seismic Safety Assessment Report for the dam site area of the adjacent Chipwi hydropower station, the dam site is located at an area with relatively stable regional structure. With 1：4000000 *seismic peak acceleration zonation map of China* (2001), it is analyzed that the seismic peak acceleration over 10% in the area is 0.20g for 50 years with a basic earthquake intensity of Ⅷ. Main structures are ranked grade 3, and the design of earthquake intensity employs Ⅷ. Earthquake resistance protection of the project is category C.

4.6 Engineering construction planning

4.6.1 Overall layout of construction site

4.6.1.1 Construction conditions

(1) Topographical and geological conditions

ChipwiRiver is winding and zigzagging from southeast to northwest. The average hydraulic gradient is 5%～6%. River valleys are deeply cut and take on the shape of ―V.” The reservoir area is of low middle mountain gorge river valley landform, and mountains on both banks are steep. Topographic slope is 35°～45°, and distributed on Grade I and II bench platforms along the river. The quaternary loose sediments in the reservoir area mainly include: alluvial-proluvial, debris flow sediment and residual diluvial. Rocks in the reservoir area are mainly gray and grayish white granitic gneiss. Gneissic schistosity is developing along the direction of river, and the occurrence is stable.

The project area enjoys the sub-tropical rain forest climate. In rainy seasons, rainstorms always last long time, and the rainfall is big, thus offering water conditions for debris flow; ChipwiRiver is in a valley, and mountains at the two banks are steep, with highly developed rock fractures and serious weathering. The ground surface is generally covered with residual diluvial clay mixed with rock block and fully-weathered rocks. Loose materials are abundant, and collapse and earth slipping occur frequently after rains, and even small landslide, thus offering material conditions for the formation of debris flow; Chipwi River is of big gradient, being 5%～6％ on average, thus offering conditions for material flow of debris flow.

(2) Major construction material supply

Major materials needed in the project include soil, rock block, gravel, cement, reinforcement, timber, and oil.

There are borrow pit, rock block quarry, and gravel quarry in the project area. Timber is supplied locally. Other construction materials should be transported across Yunnan, the boundary of China, and the transport distance is above 100km.

Ordinary external materials (including ordinary heavy pieces) are transported through railways and roads across Yunnan, China. Heavy pieces can be delivered through land transportation if they are from China; if they are from overseas, they can be shipped to AyeyarwadyRiver, and then transported to the construction site through roads.

(3) Water and electricity

Wind for construction is from mobile and fixed air compressors, and no air supply system is provided additionally.

Construction water is mainly for concrete and mortar mixing. The construction area is close to AyeyawadyRiver and ChipwiRiver, where the water supply is adequate. Water source in the construction area does not have any corrosive effect on concrete, so construction water can be pumped from the rivers through submerged pumps directly. Living water is the same with drinking water of local residents. Local tapped water is preferable, or a small impounding reservoir is employed to supply water.

Electricity for construction includes electricity for construction machines, construction lighting and living. Since there is no power grid locally, electricity for production and living in each construction section is from the self-prepared power source.

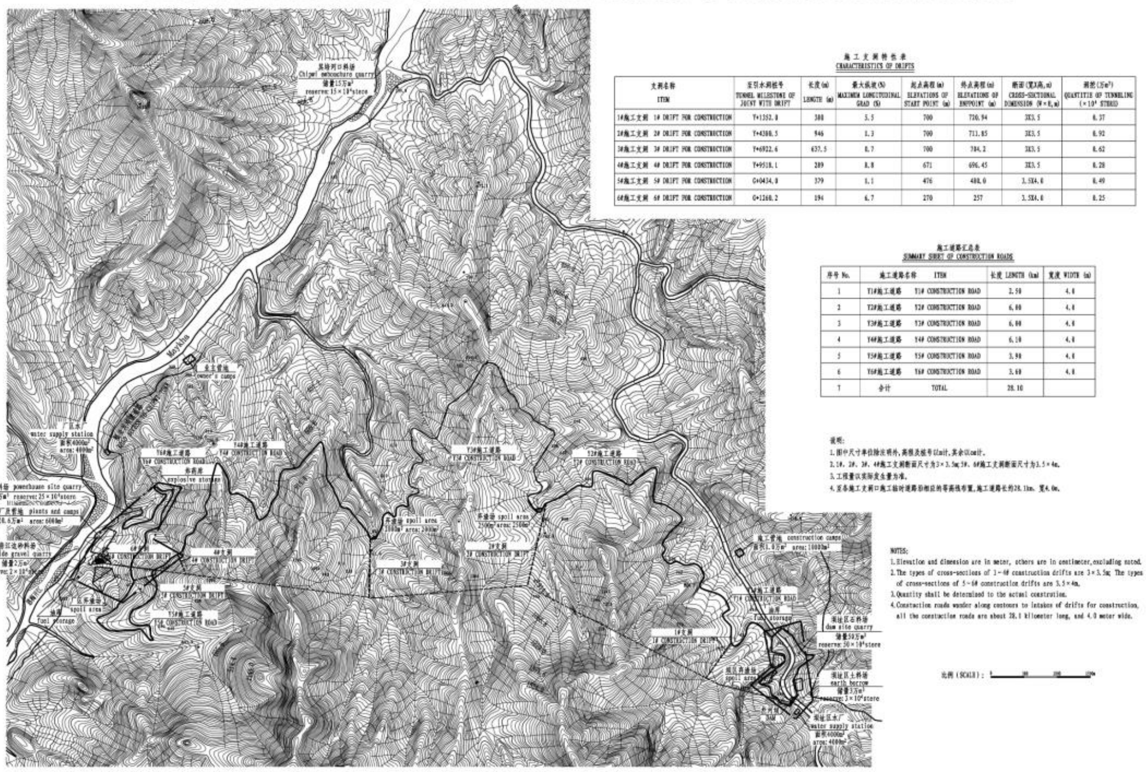
4.6.1.2 Construction general layout

The construction area is arranged in a concentrated way, and includes dam construction area, diversion tunnel construction and plant construction area. Construction auxiliary facilities are

composed of living facilities and production facilities. Living facilities include construction camp and office occupancy; production facilities include concrete mixing system, various material processing yards, material warehouse and stockyard, and machine parking lot.

附图5 电源电站施工总平面布置图

FIGURE 5 GENERAL LAYOUT OF CONSTRUCTION LOCATION OF CONSTRUCTION POWER PLANT



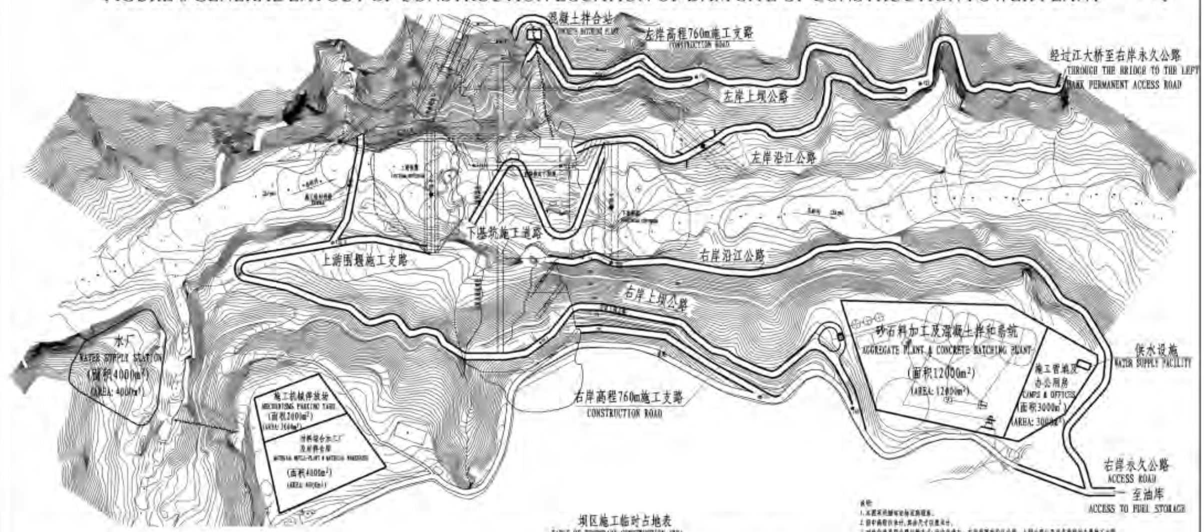
支洞名称 ITEM	至引水洞桩号 TUNNEL MILESTONE OF JOINT WITH DRIFT	长度(m) LENGTH (m)	最大纵坡(%) MAXIMUM LONGITUDINAL GRAD (%)	起点高程(m) ELEVATIONS OF START POINT (m)	终点高程(m) ELEVATIONS OF ENDPOINT (m)	断面(宽X高,m) CROSS-SECTIONAL DIMENSION (W×H,m)	洞挖(万m³) QUANTITIE OF TUNNELING (×10⁴ STERE)
1#施工支洞 1# DRIFT FOR CONSTRUCTION	Y+1352.0	308	5.5	700	720.94	3X3.5	0.37
2#施工支洞 2# DRIFT FOR CONSTRUCTION	Y+4388.5	946	0.3	700	711.85	3X3.5	0.92
3#施工支洞 3# DRIFT FOR CONSTRUCTION	Y+6922.6	637.5	0.7	700	704.2	3X3.5	0.62
4#施工支洞 4# DRIFT FOR CONSTRUCTION	Y+9518.1	289	8.8	671	696.45	3X3.5	0.28
5#施工支洞 5# DRIFT FOR CONSTRUCTION	G+0434.0	379	1.1	476	480.0	3.5X4.0	0.49
6#施工支洞 6# DRIFT FOR CONSTRUCTION	G+1260.2	194	6.7	270	257	3.5X4.0	0.25

序号 No.	施工道路名称 ITEM	长度 LENGTH (km)	宽度 WIDTH (m)
1	Y1#施工道路 Y1# CONSTRUCTION ROAD	2.50	4.0
2	Y2#施工道路 Y2# CONSTRUCTION ROAD	6.00	4.0
3	Y3#施工道路 Y3# CONSTRUCTION ROAD	6.00	4.0
4	Y4#施工道路 Y4# CONSTRUCTION ROAD	6.10	4.0
5	Y5#施工道路 Y5# CONSTRUCTION ROAD	3.90	4.0
6	Y6#施工道路 Y6# CONSTRUCTION ROAD	3.60	4.0
7	合计 TOTAL	28.10	

Aggregate processing and concrete mixing systems, construction camp and office occupancy, oil tank and quarry are arranged at the downstream right bank of the construction area of the dam. Construction camp and office occupancy are provided with water supply facilities; spoil yard is arranged at the downstream of the right bank; construction machine parking lot, material comprehensive processing plant and material warehouse, borrow pit and water plant are arranged at the high space of the right bank of the dam.

附图6 电源电站坝址区施工平面总布置图

FIGURE 6 GENERAL LAYOUT OF CONSTRUCTION LOCATION OF DAM SITE OF CONSTRUCTION POWER PLANT



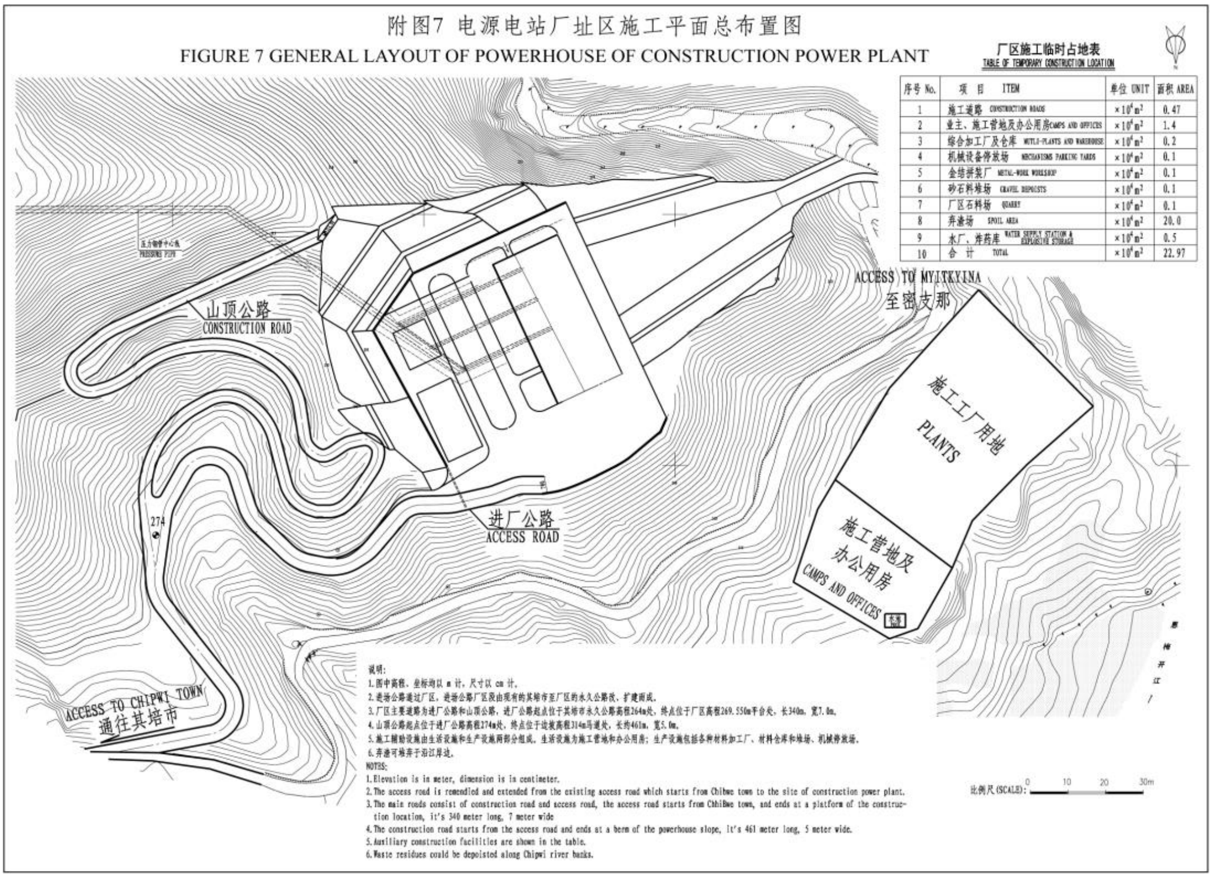
坝区主要施工道路特性表
CHARACTERISTICS OF MAIN CONSTRUCTION ROADS

部位 PART	名称 ITEM	主要指标 MAIN INDEXES			
		长度(m) LENGTH (m)	路面宽(m) WIDTH (m)	最大纵坡(%)	面积(×10⁴m²)
左岸 LEFT BANK	沿江公路	309	5.0	7.8	0.15
	高程760m施工支路	175	5.0	11.1	0.09
	上坝公路	520	5.0	5.4	0.26
右岸 RIGHT BANK	沿江公路	232	5.0	3.8	0.12
	高程760m施工支路	360	5.0	15.7	0.18
	上坝公路	265	5.0	1.0	0.13
	上游围堰上堰公路	340	5.0	7.2	0.17
	至导流洞进口公路及施工栈桥	82	5.0	0.02	0.04
	下基坑道路	200	5.0	10.0	0.1
	合计 TOTAL	2483			1.24

坝区施工临时占地表
TABLE OF TEMPORARY CONSTRUCTION AREA

序号 No.	项目 ITEM	单位 UNIT	面积 AREA
1	施工管地及办公用房	×10⁴m²	1.30
2	混凝土拌合系统	×10⁴m²	0.40
3	砂石料加工系统	×10⁴m²	0.80
4	机械设备停放场	×10⁴m²	0.20
5	材料综合加工厂及仓库	×10⁴m²	0.40
6	砂砾石料场	×10⁴m²	3.08
7	坝址区石料场	×10⁴m²	0.35
8	土料场	×10⁴m²	2.1
9	弃渣场	×10⁴m²	11.5
10	水厂	×10⁴m²	0.4
11	施工道路	×10⁴m²	1.24
12	合计	×10⁴m²	21.77

Construction camp and office occupancy are arranged close to the access road, with the elevation being 267.0m. Other production facilities are arranged close to the lower part of the plant area, with the elevation being 235.0m. In the early stage, dug waste is piled up here for site leveling. In the late stage, dug waste is piled up along the river.



附图7 电源电站厂址区施工平面总布置图

FIGURE 7 GENERAL LAYOUT OF POWERHOUSE OF CONSTRUCTION POWER PLANT

Temporary construction road to each construction adit is about 28.0km long and 4.0m wide. Site leveling is conducted for 2# and 3# construction adits. Waste from the digging of construction adit and main hole is piled up in nearby areas. Waste dug from 1# construction adit and some waste from main hole are transported to the spoil yard of the dam area; Waste dug from 4#, 5#, and 6# construction adit and some waste from main hole are transported to the spoil yard of the plant area;

Major facilities in each construction area are shown as Table 4.6-1.

Table 4.6-1 Schedule of Major Construction Facilities

No.	Item	Floor area (10,000m^2)
I.	Construction area of the dam	
1.	Sand processing system and concrete mixing system	1.2
2.	Construction camp and office occupancy	1.3
3.	Construction machinery parking lot	0.2
4.	Material comprehensive processing plant and material warehouse	0.4
5.	Borrow pit	2.1
6.	Gravel quarry	3.08
7	Dam quarry	0.35
8	Spoil yard	11.5
9	Construction road	1.24
10	Water plant	0.4
11	Subtotal	21.77
II.	Construction area of the plant	
1	Camp of the owner	1.0
2	Construction camp and office occupancy	0.4
3	Comprehensive processing plant and material warehouse	0.2

Table 4.6-1 Schedule of Major Construction Facilities (continued)

No.	Item	Floor area (10,000m^2)
4	Construction machinery parking lot	0.1
5	Gravel stockyard	0.1
6	Hardware assembly plant	0.1
7	Quarry of the plant	0.1
8	Explosive magazine	0.1
9	Spoil yard	20.0
10	Construction road	0.47
11	Water plant	0.4
12	Subtotal	22.97
III.	Construction area of diversion system	
1	2#, 3#construction adit site leveling and spoil yard	0.45
2	Construction road to each construction adit	11.2
3	Subtotal	11.65
IV.	Total	56.39

The construction arrangement for headrace tunnel will adopt the method of drilling and blasting. Cycle operations during the single explosive excavation include: Measurement and survey setting-out, drilling, loose rock removal, blasting agent fill, explosion and ventilation, safety treatment, spoil transportation, temporary support and others.

According to project arrangement, the main works are implemented underground, so working gallery should be built to finish these works underground. Design principle for construction adit: Permanent channel should be used as much as possible to reduce the project investment; safety of construction adit and the structures interacted with it or its vicinity structures should be guaranteed; the construction intensity and progress demand should be fulfilled; while the transport requirements for construction work and other large pieces should also be taken into consideration. Six construction adits should be set for diversion and power generation system with total length of 2879.5m.



附图8 电源电站引水系统施工支洞平面布置图

FIGURE 8 LAYOUT OF CONSTRUCTION DRIFTS OF THE HEADRACE TUNNEL OF CONSTRUCTION POWER PLANT

4.6.2Construction diversion

4.6.2.1 Diversion way

Water retaining dam of Chipwi Nge Hydropower Station is located about 110m at the downstream of magma rock block disposal dam. The flow is big during flood seasons and small during dry seasons. There is a bottomland at the left bank of the dam, with the elevation being 705m～713m. During dry seasons, river water is mainly discharged from the river channel at the right bank. In addition, according to dam scale and project quantity analysis, the dam can be poured in a dry season. Therefore, as for dam construction, it is preferable to intercept the riverbed once for all and adopt the tunnel or underport diversion.

4.6.2.2 Diversion standard

Water retaining dam of Chipwi Nge Hydropower Station belongs to Grade III permanent hydraulic structure. In the light of *Specifications for Construction Planning of Water Resources and Hydropower Engineering* (SDJ338-89), diversion building for the protection of permanent building construction is of Grade V. Upstream and downstream earth-rock cofferdams and diversion tunnel of water retaining dam are of Grade V.

The drainage basin of ChipwiRiver belongs to the typical mountainous river, where flood can converge quickly, and river channel storage is small. Floods may reveal typical features of mountainous floods, rising and falling sharply. Rainstorms mainly appear from June to September, or April, May and October in some years. Rainstorms occur the most frequently in June and August. According to the above flood features, design standards and feature water level of each diversion building are shown as Table 4.6-2.

Table 4.6-2 Construction Diversion Standard

Item		Time interval	Frequency (%)	Flow (m^3/s)	Discharge condition	Discharge flow (m^3/s)	Downstream water level (m)	Calculated upstream water level (m)
Diversion tunnel		Nov.～Apr.	20% instantaneous maximum	89.3	Diversion tunnel	89.3	706.80	722.38
Earth rock cofferdam	Water retaining	Nov.～Apr.	20% instantaneous maximum	89.3	Diversion tunnel	89.3	706.80	722.38
	Closure	Nov.	20% monthly average	25.4	Diversion tunnel	25.4	(713.0)	716.29

Table 4.6-2 Construction Diversion Standard (continued)

Item	Time interval	Frequency (%)	Flow (m^3/s)	Discharge condition	Discharge flow (m^3/s)	Downstream water level (m)	Calculated upstream water level (m)
Diversion tunnel closure cofferdam	Nov.～Mar.	20% instantaneous maximum	77.8	Flood discharge sediment flushing outlet	77.8	706.72	720.60
Flood season during the construction period of the dam	Full year	10% instantaneous maximum	958	Diversion tunnel + Flood discharge sediment flushing outlet+Surface outlet	958	713.94	741.64

Note: those with () are ground elevations.

4.6.2.3Diversion scheme and procedure

The scheme makes use of permanent flood discharge sediment flushing outlets as the diversion underports, which are arranged at the non-overflow dam section at the left side of overflow dam section. The upstream of diversion underports adopts diversion canals formed through foothill digging, and the downstream is combined with permanent flood discharge sediment flushing outlets for discharging.

The upstream diversion canal is 5m wide, and slopes at the two sides are 1:0.3. The bottom elevation of open channel is 715.0m; diversion underport size is 5m (width) ×6m (height), and underport elevation 715.0m; the downstream permanent flood discharge sediment flushing outlets adopt the type of dam open outlets. When upstream water depth exceeds 1.5 times of outlet height, the flowing type is pressure flow.

According to the overall progress plan of project construction, diversion procedure of water retaining dam of Chipwi Nge Hydropower Station is as follows:

Start to dig left and right dam shoulders in November of the first year, and start to dig diversion tunnel in February of the second year, and discharge water into diversion tunnel at the end of October. Water should flow over riverbed during the construction period of dam shoulders at both banks and diversion tunnel.

Close the major riverbed at the beginning of November of the second year, finish upstream and downstream cofferdam closure and fill, foundation pit water pumping in the first ten days of November, finish the rest dam sections of the riverbed under the protection of upstream and downstream cofferdams at the end of April of the third year. Water flows over diversion tunnel. Start temporary water retaining in May of the third year, close diversion tunnel in early November, and lock flood discharge sediment flushing outlet at the end of December to accumulate water.

4.6.3Construction traffic

4.6.3.1External traffic

On the basis of collecting materials such as traffic condition, development planning and major building material sources around the power station, Chipwi～Panwa Road is selected as the main traffic route to the outside. Building materials and equipment (including heavy pieces)n are from China, and transported from Yunnan through railways and highways. The concrete transport route is Kunming→Dali→Bao Son→Tengchong→Panwa→Xinkong→dam site.

Heavy pieces can be transported to Kunming and Dali through railways, and then transferred to the construction site through trucks. In addition, Tengchong→Waxiao→Chipwi road can be taken as auxiliary access to the site after partially repaired.

Due to the need of the construction of Chipwi Hydropower Station, the above roads are to be expanded. During the period of transporting materials for Chipwi Nge Hydropower Station, it is required to coordinate with the road constructing party so as to keep the roads clear.

(1) Tengchong～Panwa Road

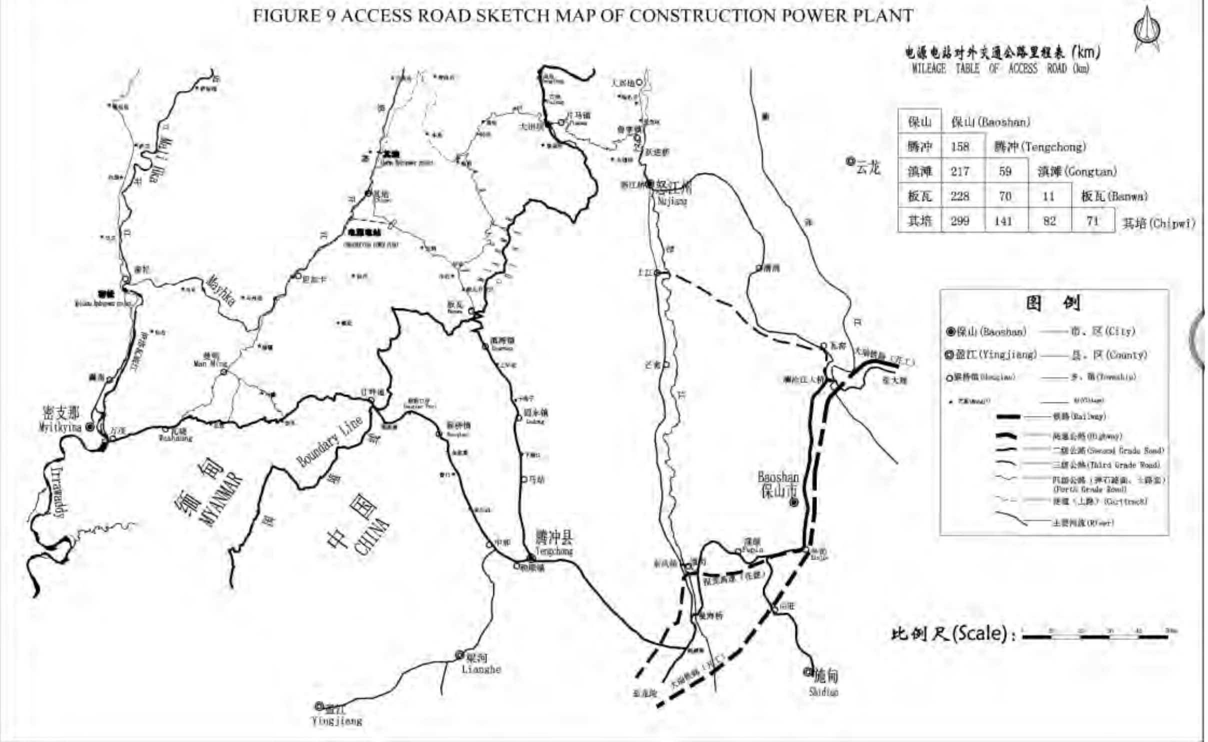
Tengchong～Panwa Road is a newly built plain hilly Grade II road open to traffic and passing through Gudong Town and Diantan Town. Panwa at No. 4 boundary marker between China and Myanmar is the capital of the first special economic zone of Kachin State, and close to the boundary line. Teng Chong～Diantan is 59km, and Diantan～Panwa11km, with the total length being 70km. With bituminous pavement, Teng Chong～Diantan roadbed is about 10m wide, and Diantan～Panwa roadbed is about 8m wide. The highest elevation of the road is about 2,300m at No. 4 boundary marker between China and Myanmar (crossing of Panwa), and the lowest elevation is about 1,700m at Tengchong.

(2) Panwa～Chipwi Road

Panwa～Chipwi Road runs downward along Chipwi River to the dam site via Panwa and Xinkong, with the total length being 71km. It is of taw pavement, and roadbed width about 5m. The road condition is mediocre.

附图9 电源电站对外交通示意图

FIGURE 9 ACCESS ROAD SKETCH MAP OF CONSTRUCTION POWER PLANT



4.6.3.2Internal traffic

A river-crossing bridge is built 2km at the downstream of the dam site. It is connected with a 2km permanent road leading to the dam site at the left bank. The left and right banks are connected with the main roads from the permanent road. Two roads are arranged, namely the road along the river and the road up to the dam.

Diversion system is from the access road at the left bank to the temporary zigzag road along

the mountain, and finally to each construction adit.

The plant is connected with the access road through the road between ChipwiTown and Myitkyina. Construction traffic in the site is shown as Table 4.6-3.

Table 4.6-3 Construction Traffic in the Site

Name	Length (m)	Width (m)	Road grade
Permanent road at the left bank	2000	5.0	Grade III
Road along the river at the right bank	232	5.0	Grade III
Road leading to the dam at the right bank	265	5.0	Grade III
Road along the river at the left bank	309	5.0	Grade III
Road leading to the dam at the left bank	520	5.0	Grade III
Temporary roads for water diversion system	28000	4.0	Grade IV
Access road to the plant	340	7.0	Grade II
River-crossing bridge			

4.6.4Stockyard planning

(1) Rock block stockyard planning

The dam area and the plant area are provided with a rock block stockyard separately. The rock block stockyard of the dam area is located at the right bank of ChipwiRiver. There is a mountain at the north side about 1km downstream of the dam site, and the working thickness is 50m, and reserves about 500,000m^3; the rock block stockyard of the plant area is located about 800m at the left upstream of Nmaihka River, and the debris flow gully is the boundary of the south side. The major area is the slope on the north side of the debris flow gully. The slope crest elevation is about 500m, and the slope bottom elevation about 245m. The working thickness is big, and reserves around 250,000m^3. It is planned to exploit 152,900m^3 of rock blocks for the project, including 117,990m^3 for the dam area and 35,900m^3 for the plant area.

Surface coverage and fully weathered layer of rock block stockyard adopt 180Hp bulldozer aggregates. Usable layers of rock block are exploited from up to bottom through the step blasting method, dug through1.5m^3～3m^3 grab, and transported through 10t～15t dump trucks. Average transport distances of rock block stockyards of the dam area and the plant area are 1.0km separately.

The two rock block stockyards are close to the project area, and can be exploited along the gully and road. Gravel roads leading to the dam site or plant area pass through the stockyard, thus rendering favorable traffic conditions. Stockyard reserves and quality meet requirements.

(2) Gravel quarry planning

Gravel quarry of ChipwiRiver is planned to be located at the convergence of ChipwiRiver and the left bank of NmaihkaRiver. The quarry is 250m long along ChipwiRiver. The external side is a sandy gravel low flood plain, which is about 200m long along NmaihkaRiver. The distribution area of the quarry is 25,000m^2, the working thickness 6m, and the sand reserve 150,000m^3. Gravel quarry of the plant is located at the left bank of the downstream NmaihkaRiver. It is a fine sand flood plain. It is about 150m long and 50m wide, the working thickness 2m～3m, and reserve 20,000m^3. After comprehensive analysis, we select the gravel quarry of ChipwiRiver. Chipwi Nge Hydropower Station requires 56,100m^3 of gravel quarry.

Each covering layer and surface useless layer of gravel quarry of Chipwi River is cleaned off through 100Hp～120Hp bulldozer. The useful layer is dug and loaded through 1m^3～2 m^3 grab, and transported to the concrete aggregate yard through 8t～15t dump truck. The average transport distances of gravel quarry to the dam area and the plant area are 16km and 10km respectively.

Gravel quarry of ChipwiRiver is mainly fine aggregate. The quarry is of gentle landform, big distribution area, and favorable exploitation conditions. A road along ChipwiRiver is leading to the dam area. The reserves and quality can basically meet requirements.

(3) Borrow pit planning

Borrow pit is planned to be located at the upstream of the dam on the right bank of ChipwiRiver, and composed of Grade II bench platform and rear gentle slope behind it. Grade II bench platform distribution elevation is 775m～785m. It is about 95m～130m long along the river, 80m wide, and 9,000m^2 in area. The reserves are 25,000m^3. The rear gentle slope is located at the north side of the road. It is 80m～100m long and 30m wide. The area is 2,500m^2, and the reserves 5,000m^3. It is planned to exploit 42,000m^3 of soil for Chipwi Nge Hydropower Station.

Adopt plane exploitation method in construction. 1.0m^3 grab is employed to dig and load soil; 100HP～120HP bulldozer is employed to collect soil; and 5t～10t dump truck is employed to transport soil to the site.

The distance from borrow pit to the dam area is less than 0.5km. The landform is gentle, distribution area big, and exploitation & transportation conditions favorable. Its reserves and quality can basically meet requirements.

4.6.5Engineering waste and spoil yard planning

4.6.5.1Engineering waste

Excavation quantity of buildings of the project is 812,600m^3 (natural cubic meter), including 28,100m^3 of diversion tunnel excavation, 159,500m^3 of dam excavation, 170,700m^3 of diversion system excavation, 409,800m^3 of plant excavation, 1,800m^3 of foundation treatment, 5,000m^3 of dangerous rock excavation, and 37,000m^3 of upstream earth-rock cofferdam dismantling.

Fill quantity of the project is 111,200m^3, including 6,400m^3 of rock block, 5,700m^3 of gravel, 57,100m^3 of rock ballast, and 42,000m^3 of clay (converted into 49,600m^3).

33,700m^3 of excavated material is used for building fill of the project; 110,000m^3 of excavated material from diversion tunnel is used as concrete aggregate of the processing plant, lower section of diversion tunnel, and the dam area. 68,300m^3 (natural cubic meter) and 16,300m^3 (natural cubic meter) are exploited from the quarry of the dam area and the quarry close to the plant area. In addition, 50,400m^3 natural fine aggregate is exploited from the gravel quarry of Chipwi River; 49,600m^3 (natural cubic meter) of filling soil in the project is exploited from the borrow pit of Chipwi River.

207,100m^3 waste is to be piled up at the spoil yard for the dam area while 359,400m^3 waste is to be piled up at the spoil yard for the plant area. 25,000m^3 and 19,400m^3 of waste should be planned for 2$^\#$ construction adit opening leveling and spoil yard and 3$^\#$ construction adit opening leveling and spoil yard respectively.

4.6.5.2Spoil yard planning

1) Spoil yard for the dam area

Spoil yard for the dam area is planned to stock 207,100m^3 of waste, and to cover an area of

115,000m^3. It is located at the left downstream of the dam, and can stock wastes from the dam, some diversion tunnels, left dam shoulder, diversion tunnel inlet and dam section of diversion tunnel.

2)Spoil yard for the plant area

Spoil yard for the plant area is planned to stock 359,400m^3 of waste, and to cover an area of 200,000m^3. It is located at the left bank of NmaihkaRiver. The yard can stock excavated material of the plant (including using material of excavated material), and wastes (excluding rock waste for leveling the adit) from 4$^\#$～6$^\#$construction adit and the lower section (pile number Y+8015～9650m) of diversion tunnel of the corresponding construction adits and pressure steel pipes.

3)Waste disposal area for construction adit

To reduce the transport distance of waste, waste dug from 1$^\#$ construction adit, waste from 2$^\#$～3$^\#$ construction adits, and waste dug from diversion tunnel of 2$^\#$～3$^\#$ construction adits are stocked at the spoil yard. Using material used for concrete aggregate in diversion tunnel is stocked at the yard. It is required to plan 25,000m^3 waste for the leveling of the opening area of 2$^\#$ construction adit and spoil yard, and it is required to plan 19,400m^3 waste for the leveling of the opening area of 3$^\#$ construction adit and spoil yard.

4.6.6Construction plant and camp

4.6.6.1Construction plant

(1) Aggregate processing system

In the project of Chipwi Nge Hydropower Station, the dam area and plant area are provided with an aggregate processing system separately.

Aggregate processing system of the dam area mainly undertakes the tasks of concrete mixing and aggregate production needed by the dam, the upper section of diversion tunnel, and diversion work. The processing plant is arranged at the downstream of the dam, with the elevation being 740m, adjacent to the mixing system and covering an area of 8,000m^2. The designed production capacity of the aggregate processing system is 160t/h, including 1105/h broken stone and 50t/h sand. The total quantity of finished aggregate needed is 191,000m^3, including 128,000m^3 of broken stones and 63,000m^3 of finished sand.

Aggregate processing system of the plant area mainly undertakes the task of producing aggregates for the plant and the lower section of diversion tunnel. Due to the small concrete quantity of the plant area, mobile rock-crushing station is adopted for producing aggregate needed. Aggregate production capacity is 50t/h, and the total quantity of finished aggregate is about 95,000m^3.

(2) Concrete mixing system

The dam area is equipped with a concrete mixing system, and the plant area is equipped with a mixing station. The mixing system is configured according to the placing intensity of 26,000m^3 in peak months. The mixing system can produce 80m^3/h of concrete at normal times. AHL120-3F1500 mixing plant is configured, with the production capacity being 120 m^3/h on the nameplate. The mixing station is configured according to the placing intensity of 7,000m^3 in peak months. The mixing station can produce 25m^3/h of concrete at normal times. AHZ40-2F750 mixing station is configured, with the production capacity being 40 m^3/h on the nameplate. The mixing system of the dam area covers an area of 4,000m^2, and shares the aggregate stockyard with the sand system. The elevation of the stockyard is 740m. Major technical parameters of the concrete system of the dam area are shown as Table 4.6-4.

Table 4.6-4 Major Technical Indexes of Concrete Mixing System in the Dam Area

Serial No.	Item		Unit	Index	Remarks
1	Concrete design peak month strength		10^4m^3/month	2.6	
2	Normal temperature concrete production capacity		m^3/h	120	
3	Binding material storage quantity	Cement	t	2000	Sacked cement
		Coal ash	t	800	Sacked coal ash
4	Scale of compressor station		m^3/min	60	
5	Water consumption		m^3/min	100	
6	Production shift		Shift	3	
7	Production staff		Person	40	
8	Covered area		m^2	400	
9	Floor area		m^2	4000	

(3) Comprehensive processing plant

Comprehensive processing plant includes reinforcement yard, prefabrication yard, and timber yard. External goods are transported to the construction site through trucks. The upstream open space of the dam area is provided with comprehensive processing plant and material warehouse, and the plant area is provided with comprehensive processing plant.

(4) Machinery equipment parking lot

The dam area and the plant area are provided with a machinery equipment parking lot separately. They assume the maintenance, large and medium repairs of construction machinery, replacement of large parts, processing of some non-standard parts, and repair of transport vehicles.

(5) Water and electricity supply systems

1) Water supply system

According to statistics, production water quantity in the dam area is 5500m^3/d, and living water quantity is 800m^3/d, totaling 6300m^3/d. Due to the small water quantity, water is supplied to each part of the plant area according to the living water standard.

It is planned to provide a water supply system in the dam area and the plant area separately. The water supply system of the dam area is arranged at the right bank. Water intake pumping station is the simple float-type pumping station, and the water source is ChipwiRiver. The pumping station is located at the right bank about 400m downstream of the dam. The pumping station is configured with three submerged pumps, two in operation and one for standby. Unit water intake quantity is 130 m^3. The water supply system of the plant area is configured at the upstream. A simple float-type pumping station is arranged at the left bank of NmaihkaRiver, and configured three submerged pumps, two in operation and one for standby. Unit water intake quantity is 45m^3/h.

2) Power supply system

After calculation, the maximum construction electrical load is about 3500kW. Since there is no power grid, diesel generator is arranged for power supply in the light of actual need.

① Construction area of the dam: a diesel generator room is arranged at the aggregate processing and concrete mixing system, material comprehensive processing plant and material warehouse, left and right bank non-overflow dam section, and left bank concrete mixing system separately.

② Power generation diversion system: a diesel generator room is arranged close to the opening of each construction adit.

③ Power station plant area: a diesel generator room is arranged close to the mixing station

and the construction area of the plant.

Power supply network of the dam, diversion system and power station plant requires laying 30km-long 0.4kV cables. The total capacity of diesel generators is about 7,000kW.

4.6.6.2Construction camp

It is planned to arrange a construction camp and an office occupancy in the construction areas of the dam and the plant separately. The construction camp and office occupancy of the dam cover an area of 1.3hm^2, and that of the plant 0.4 hm^2. The owner‘s camp covers an area of 1 hm^2.

4.6.7Construction progress

The overall construction period is 32 months. The construction preparation shall last three months, the construction of the main work 26 months, and power generation of the second and third units four months.

(1) Construction preparation

Construction preparation starts from September, October and November of the first year, and covers the construction of internal and external traffic, site leveling, water and electricity supply, construction camps, aggregate processing system, concrete mixing system, etc.

(2) Dam project

Start to dig the non-overflowing dam sections at the two banks from November of the first year, and finish the work in July of the second year; start the construction of diversion tunnel in February of the second year and finish the work in October; start to place concrete in August of the second year, and finish the work in February of the third year.

Start to fill upstream and downstream cofferdams in November of the secondary and close the flow in the first ten days. Finish digging foundation pits within one month, and start to place dam concrete in December of the second year, and finish the work in May of the third year.

(3) Water diversion system

Finish the digging of the foundations of open pipe sections of water inlet before April of the second year; start to place concrete in November of the second year, and finish the work within two months; and install steel pipes from January to March of the third year.

Six construction adits for diversion tunnel will be started in November of the first year. The longest 2$^{\#}$construction adit will be completed in June of the second year; diversion tunnel will be finished before the end of June of the third year; concrete placement in the adit will be finished in October of the third year.

Start the installation of pressure steel pipes in February of the second year, and finish the work in August of the third year. External concrete placement of steel pipes will be finished one month later.

(4) Plant project

Start to dig plant foundation in November of the first year, and finish the work in July of the second year. Start to place concrete in November of the second year, and finish the work in April of the third year; units will be installed three months after concrete placement. The first unit shall start power generation in December of the third year. Block diversion tunnel in November of the third year, and lock the gate to accumulate water at the end of December.

4.6.8Laborers and major construction machinery

(1) Laborers

The number of laborers during the peak construction period of the project is 830.

(2) Using quantities of major building materials

Using quantities of major building materials of the main works and temporary works are calculated according to the actual demand. Materials for temporary works include temporary buildings, steel formwork, reinforcement and tie bar serving the construction of major buildings.

Year-on-year using quantities of major building materials are shown as Table 4.6-5.

Table 4.6-5 Year-on-year Using Quantities of Major Building Materials

Serial No.	Name	Unit	1st year	2nd year	3rd year	Total
1	Cement	t	500	16950	18700	36150
2	Reinforcement, steel	t	550	4820	6655	12025
3	Timber	m^3	40	85	70	195

(2) Major construction machinery

Models and quantities of major mechanical equipment needed by Chipwi Nge Hydropower Station are determined according to construction procedure, progress and intensity, shown as Table 4.6-6.

Table 4.6-6 Major Mechanical Equipment of Earth-rock Works

Serial No.	Name	Model performance	Unit	Qty.
1	Dump truck	5t～10t	Pcs	32
		8t～15t	Pcs	52
2	Grab	1m～2m^3	Pcs	12
		3m～4m^3	Pcs	2
3	Bulldozer	180 Hp～220Hp	Pcs	6
4	Vibrating roller	15t～18t	Pcs	3
5	Down-the-hole drill		Pcs	16
6	Pneumatic drill	Air leg type	Pcs	36
7	One-arm drill jambo		Pcs	12
8	Shotcrete machine	4 m^3/h～5m^3/h	Pcs	9
9	Ventilator		Pcs	9
10	Air compressor	9 m^3/min～50m^3/min	Pcs	14
11	Crawler loader	0.25m^{3}clay type	Pcs	12
12	Trolley		Pcs	36
13	Battery truck		Pcs	12
14	Geological abrasion drill		Pcs	10
15	Grout pump	200/100	Pcs	10
16	Automatic recorder		Pcs	10

4.7 Land occupation and resettlement of inhabitants

4.7.1Land occupation

(1) Permanent land occupation

Permanent land occupation is composed of reservoir inundation and land occupied by the project.

Normal pool level of the reservoir of Chipwi Nge Hydropower Station is 740m, total length of damming 0.75km, and total length of reservoir banks 2.13km, including 0.82km of left bank and 1.31km of right bank. Water area of the reservoir is 9.7hm^2, and land area inundated 8.1hm^2, including 0.1hm^{2}of garden area, 2.5hm^2 of economic forests, 0.6hm^2 of commercial forests, 1.6hm^2 of grassland, 0.1hm^2 of shrubwood, and 3.2hm^2 of other lands. No houses are involved.

According to the overall layout of the construction, the construction area of the dam covers 4.8hm^2(overlapping area of dam and reservoir is included into the reservoir area), including 0.6hm^2 of paddy field, 0.4hm^2 of garden, 1.9hm^2 of economic forest, 0.1hm^2 of commercial forest, 0.4hm^2 of grassland, 1.1hm^2 of shrubwood, and 0.3hm^2 of other lands. No houses are involved. The construction area of power house covers 2.8hm^2, including 2.1hm^2 of economic forest and 0.7hm^2 of grassland. No houses are involved.

(2) Temporary land occupation

Temporary land occupation of the project mainly includes accessory facilities such as construction road, production and living areas, stockyard and spoil yard. Temporary land occupation covers a total area of 56.39hm^2, including 12.91 hm^2 of construction roads, 5.90hm^2 of production and living areas, 5.63 hm^2 of stockyard, and 31.95 hm^2 of spoil yard.

4.7.2 Resettlement of inhabitants

Since land requisition does not involves resident houses but a tiny amount of gardens and forests, land requisition of the project will have little impact on local residents' production and living, and will not lead to resettlement of inhabitants.

4.8 Project investment

Static total investment in the project is RMB 1.119 billion Yuan.

5 Environmental Status

5.1 Overview of basin environment investigation



In accordance with the TOR of EIA on Hydropower Development of Ayeyawady River Basin above Myitkyina and requirements of Myanmar government departments, under the orgnization of CPIYN, CDC and BANCA, a joint investigation team comprised ofSCBG, SCIEA, IHE and BANCA was established, to conduct a detailed investigation on the status of aquatic organisms, terrestrial plants, terrestrial animals, environmental quality and social environment in the region of seven cascade hydroelectric stations such as Myitsone; to organize a questionnaire survey for collecting attitude to hydroelectric development in Myanmar, environmental concerns and requirements from people affected by the hydroelectric development.Its investigation started in January 2009 and came to the end in May, which lasted five months. BANCA completed other investigation work in July. There are about 260 personnel involved in the investigation, including more than 100 experts from China and Myanmar.







Field Investigation



Field Investigation of terrestrial



Field Investigation of aqutic organism

5.2 Natural environment

5.2.1Topography

(1)Reservoir area

Reservoir area of Chipwi Nge Hydropower Station is a low-medium mountain gorge type river valley, with steel mountains on both sides, terrain slope of 35 ° to 45 °, riverside mountain top elevation of 1000m to 1500m, river bed elevation of 710m to 760m and relative height difference of 300m to 800m. Level Ⅰ and Ⅱ of terraces are distributed along the river. There is a gully at the head of the reservoir area. It is more than 1000m long and 5m to 30m wide, with cutting depth of 5m to 20m and flow of about 1.5m^3/s. On the gully bottom are gentle slopes and platforms accumulated due to debris flow. Their terrain slope is generally lower than 10 °.

ChipwiRiver snakes with overall flow direction of northwest, average hydraulic slope of 5% to 6% and deep V-shaped valley.

(2) Dam site area

On both sides of the dam site are wide and thick mountains. The terrain is steep with a slope of 30 ° to 50 °. The area is covered with vegetations. Slopes on both sides follow the top elevation of above 1000m and relative height difference of above 300m. The area seems a narrow V-shaped valley. ChipwiRiver flows in the direction of NW325°, with valley bottom width of 60m to 90m, river surface elevation of about 700m to 710m and water depth of about 0.5m to 3m. The valley width will be about 155m to 169m when normal water level reaches 740m.

There are Level Ⅰ and Ⅱ terraces in the upstream of the upper dam line on the right bank. Terrace face is inclined to the river bed in the downstream and almost consistent with river bed in the slope. Level Ⅰ and Ⅱ terraces respectively follow the elevation of 719m to 739m and 773m to 790m, between are bank slopes at the gradient of 33°. In the downstream of the lower dam line on the left bank, there is a terrace of Level I along the ChipwiRiver. The terrace face is inclined to the river bed in the downstream with an elevation of 692m to 712m.

On both sides of the dam site area are gullies in different sizes. There are mainly two gullies on the right bank to have a perennial stream respectively with a flow rate of 5L/min and 1.5m^3/s; there are 8 small gullies with a spacing of 30m to 230m on the left bank, of which some have a perennial stream with a flow rate of generally lower than 100L/min.

(3) Powerhouse area

The powerhouse area belongs ot low-medium mountains on the south edge of KachinMountains. It is located on the left bank slope of NmaihkaRiver about 9km in the downstream of ChipwiTown. The powerhouse ground elevation is 269.7m and machine stable excavation elevation is 252.5m. NmaihkaRiver flows through the powerhouse area by southwest 219°, with water level elevation of about 210.6m to 211m, slope top elevation of about 1100m to 1500m and relative height difference of about 800m to 1200.

The slope below the elevation of 240m is subject to river alluvium and torrential sediment. It is relatively gentle with a gradient of about 8°. Above 240m is a sloping terrain with a slope of about 25°, of which some can reach the slope of 40 ° to 50 °. The powerhouse is in the slope area on the rear side of riverside road, with an elevation of 266m to 321m. In the rainy season, slope surface suffers soil erosion. Silty clay and completely weathered layer are scoured to form gullies and even local soil chutes so as to cause broken slope.

There are small gullies along the slope in the powerhouse area, of which the upstream gullies

about 800m from the powerhouse and downstream gullies are larger and have a perennial steam respectively with a flow of 500L/min and 300L/min. Their average slope is greater than 10%.

5.2.2 Hydrogeology

Chipwi Nge Hydropower Station is located in KachinMountains in the north of China-MyanmarMountains. Its geotectonic element belongs to Qinghai-Tibet rejuvenated orogen. It is mainly adjacent to Chipwi fault extended along NmaihkaRiver, ChipwiRiver as a branch and Chipwi – Tengchong nearly EW fault. The Chipwi fault has been not active since about 1.18 million years ago. There is no active fault within the range of 5km near the site. The site is located in a region with a relatively stable regional structure.

The region is located between the Myanmar medium-deep seismic belt and China Lonling – Tengchong – Lushui seismic belt. According to historical records, there were frequent earthquakes erupted in the Lonling – Tengchong – Lushui seismic belt mainly at a time around the 30s of 20^{th} century, with the highest earthquake magnitude of 6.5 (in October 17, 1929 and August 11, 1933),where is about 29km away from the northwest of the dam site.

As the construction power plant is nearer to the Longling – Tengchong – Lushui seismic belt rather than the dam site of Chipwi Hydropower Station, according to the 1: 4,000,000 Seismic Dynamic Peak Acceleration Demarcation Map of China (GB18306-2001) and the comprehensive analysis on seismic parameters of the neighboring Chipwi dam site, it can be concluded that the seismic peak acceleration with 10% probability of exceedance in 50 years is 0.20g while the corresponding basic seismic intensity is Ⅷ.

(1) Reservoir area

There are more exposed bedrocks near river bed on both sides of the reservoir area. They are Precambrian gray and grayish white rough - medium granitic gneiss and locally loose Quaternary deposits of 1m to 15m thick; there is no fault or fold in the reservoir area. Gneissose structure is distributed along the river by SW225°to 240°with an inclination of 67° to 70°. Its occurrence is stable.

Gullies on both banks of ChipwiRiver are feather-shaped with a spacing of 70m to 500m. Groundwater is classified into bedrock fissure water and pore water according to burial conditions. No spring water is exposed on the surface and hydrogeological conditions are simple.

In summary, geological conditions are simple in the reservoir area without fault. The reservoir basin is in less permeable granitic gneiss rocks, so the reservoir has the better closure conditions without leakage. On both banks of the reservoir are mainly rocky embankment slopes. There are sporadic unstable rocks in the head and local sections, but there is no reservoir immersion. In the submerged area are mainly trees. Due to influences of debris flow in the upstream of the reservoir, solid flow materials are rich in the trunk and tributaries, so the reservoir is subject to sedimentation.

(2) Dam site area

Mountains on both sides of the dam site area are steep and diorite granitic gneiss is hard. Due to river cutting, unloading fractures are distributed along the river and gully. There are four positions to have dangerous rockmass in small scale. Geological structure is simple in the dam site area. Upon investigation, there is no fault or fold. Gneissic schistosity is subject to strike of NW315 ° to 330 °, inclination of SW225 ° to 240 ° and dip angel of 67 ° to 70 °.

Upon investigation, there is no bedrock fissure spring water. Two springs are distributed in eluvial layer above the road, with water outlet elevation of about 780m. a number of water

flows out from left bank gullies, with the water point evaluation of above 780m. Groundwater in the dam site area is about 14.5m deep. Bedrocks in the dam site area are diorite granitic gneiss belonging to medium-weakly permeable rocks.

Mountains on both sides of the dam site area are complete. The formation lithology is single. All rocks are diorite granitic gneiss with more fissures, simple hydrogeological conditions and water permeability. Dam foundation rocks are subject to high strength and completeness. There is no massive adverse geological phenomenon such as collapse and landslides in the area.

(3) Powerhouse area

Chipwi fault on the opposite bank of the powerhouse area runs along NmaihkaRiver on the right bank. Geological structure is simple in the powerhouse area, where there is no fault or fold identified in the investigation. Gneissic schistosity is subject to strike of NE20° to 45°, inclination of SE110°to 135° and dip angel of 67 ° to 76°.

Hydrogeological conditions are simple in the powerhouse area where there is no spring water identified in the investigation. Burial depth of groundwater is different. It is generally 19.3m to 26.7m in the mountain slope and 3.2m to 8.4m in the gentle slope near gullies and roads.

Terrain is relatively flat in the powerhouse area where overburden and highly weathered rocks are thick and foundation rock fissures are more but less complete. In the upper part of the slope is loose layer slope. It is prone to sliding after excavation. The lower rock slope has four groups of fissures which are mostly opened and locally filled with a small number of silty clay and gravel. Due to poor shape and properties, the slope may become unstable after excavation.

5.2.3 Climate

The project area is located in the Asian southwest monsoon region. Its climate is dominated by the southwest monsoon. Three seasons prevail in the area, including summer of March to May, rainy season of June to October and cool season of October to next February. Minimum temperature occurs in January, 20℃ to 25℃ in average; maximum temperature occurs in April, 25℃ to 30℃ in average. In accordance with statistics of Lushui Station adjacent to Chipwi Nge, annual average number of thunderstorm days is 52.1. As shown from 2003-2004 water temperature data of Myitson Weather Station, annual average water is 23.0℃.

In the AyeyawadyRiver basin, the precipitation is rich. Annual precipitation is 2000mm to 4000mm in the delta and north area. It is a smaller value of 600mm to 1000mm in the midstream plains. The peak precipitation occurs in July. In every rainy season, the southwest monsoon prevails with abundant rainfall so that the river water sharply increases to often cause floods. The rainfall is less from March to mid-May so that river water level drops. A number of beaches and islands are exposed in the river valley and river width becomes reduced. For example, the river surface width is less than 500m in February but more than 3km in August with an annual level change up to 10m in Bhamo in the upstream of AyeyawadyRiver.

5.2.4 Hydrology and sediment

In the AyeyawadyRiver basin, runoff supply is mainly rainfall in the flood season but it is mainly deep groundwater and fewer high mountain snowmelt in the dry season. The flood season is mainly from May to October and its runoff accounts for about 81.0% of annual runoff; the dry season is mainly from November to next May and its runoff accounts for about 19.0% of annual runoff. In the basin of Chipwi River, rainstorms mainly occur in June to September. They reach the peak in June, accounting for 27% of annual number. The flow rate

is 2540 m^3/s for five-hundred-year flood, 1980m^3/s for one-hundred-year flood and 1320 m^3/s for 20-year flood.

In Chipwi Nge Hydropower Station, annual average flow is 40.1 m^3/s, annual average runoff is 1.26 billion m^3 and annual average runoff depth is 2288mm. Control catchment area above the dam site of Chipwi Nge Hydropower Station is 552.3km^2. Annual average flow rate is 40.1 m^3/s and annual runoff is 1.26 billion m^3 at the dam site.

In Chipwi Nge Hydropower Station, annual average sediment discharge is 724,000 t, annual average bed load discharge is 145,000 t andannual average total discharge is 869,000 t.

5.2.5 Soil and soil erosion

Main soils in the project area include brown red soil, reddish yellow soil, yellow soil, yellow-brown soil, brown soil, dark brown soil and so on.Fertile alluvial soils are distributed in the riverside area. In the project area, ground slope is not lower than 35°, vegetation coverage is about 60% and native soil erosion is mainly moderate.

5.3 Ecological environment

5.3.1 Terrestrial plants

(1) Florology

In ChipwiSection of NmaihkaRiver involved in this project, floristic composition belongs to tropical Asia (India - Malaysia) distribution area. It is closely connected with eastern Himalayan vegetation region on the north and takes SalweenRiverValley in the east as the boundary between it and Chinese distribution area. Thus, the basin is subject to floristic composition mixing between the east and the west and between the south and the north. The area is close to southwest part of Yunnan. Its florology is largely similar to that of GaoligongMountains.

In the floristic composition of the vegetation are mainly ingredients of Southeast Asia followed by other tropical ingredients. The vegetation is mainly woody plants, of which many plants are direct descendants or relicts of Tertiary ancient tropical flora. Tropical rainforests are characterized by dipterocarpaceae and take special crypteroniaceae and tetramelaceae of Southeast Asia as the sign. Their number of genus and species is small, but it is sufficient to shown close relation with typical tropical rainforests in Southeast Asia. In addition to the above families, nutmeg, sapotaceae, garcinia, annonaceae, homalium cochinchinense, combretaceae, rhizophoraceae, barringtoniaceae, burseraceae and xanthophyllaceae all are tropical families.

As shown from statistics, there are 127 families, 357 genera and 556 species of vascular plants in Chipwi section of NmaihkaRiver, including 21 fern families, three gymnosperm families and 103 angiosperm families. Tropical composition is very obvious in the flora.

Due to intense human activities and serous deforestation, most tropical rainforests in the project influence area have been damaged over the past few decades. Small strips of secondary tropical rainforests are available locally. A large area of vegetation retrogressively becomes savanna bamboo forests generated after damage of the rainforests. They mainly consist of kapok and bamboo for animal husbandry.

(2) Vegetation type

As shown from line transect survey of terrestrial plants and sample investigation in typical sections, vegetation type is simple in the area. Most of the area is covered with dominated savanna bamboo forests, tropical monsoon forests and evergreen broad-leaved forests such as kapok, male bamboo, duabanga grandiflora, kapur and balau. Only in local sections are small

strips of tropical rainforests. In river bank sections or central bars are riparian shrub and floodplain grass in zonal distribution.

In accordance with survey results, existing vegetation in Chipwi section of NmaihkaRiver includes 7 vegetation types, 9 vegetation subtypes and 13 formations. Classification of vegetation type is as follows:



Rainforest



Tropical monsoon forest



Evergreen broad-leaved forest



Tropical savanna bamboo forest



Tropical savanna banana forest



Shrub



Artificial vegetation

Table 5.3-1 Classification of Vegetation in Chipwi section of NmaihkaRiver

Vegetation type	Vegetation subtype	Formation
Rainforest	I Humid rainforest	1. Dipterocarp and balau
Tropical monsoon forest	II Semi-evergreen seasonal forest	2. Duabanga grandiflora, chukrasia tabularis and Polyalthia spp.
Evergreen broad-leaved forest	III Monsoon evergreen broad-leaved forest	3 Castanopsis forest in India
		4. Castanopsis forest
		5. Form.Schima wallichii
		6 Engelhardtia roxburghiana and alder grove
Tropical savanna bamboo forest	IV humid savanna bamboo forest	7. Kapok and male bamboo forest
Tropical savanna banana forest	V Humid savanna banana forest	8 Balau and wild banana forest
Shrub	VI tropical roadside wasteland evergreen shrub	9. Alangium, bauhinia – mikania and fragrant eupatorium herb community
	VII tropical floodplain shrub	10. Water willow - rose - arundo donax community
Artificial vegetation	VIII artificial woody vegetation	11 Citrus Park
	IX artificial herbal vegetation	12 Farmland
		13 Slope farmland (slash-and-burn cultivation)

Kapok and male bamboo formations of tropical savanna bamboo vegetation are most widely distributed in the area. The community is a secondary vegetation generated after artificial destruction of tropical rainforests. Its appearance is similar to savanna monsoon rainforest community. *On the lowlands and the lower slopes, the upper arbors comprising kapok and other large big arbors highlight on top of the crown canopy. Common big arbors include duabanga grandiflora, radermachera sinica, excoecaria sebifera, bischofia javanica, quebracho and a variety of banyans. In the middle and upper part of mountain slope, big arbors mainly include balau, dipterocarp and dipterocarp.* The lower and middle layers of the community are dominated by sympodial bamboos such as dendrocalamus brandisii. The dendrocalamus brandisii and small-medium arbors form the dense secondary canopy, mainly including ironwood, chisocheton siamensis, leea guineensis, mallotus japonicus and bridelia tomentosa.

(3) Characteristics of vegetation succession

Zonal vegetation type in the area is humid rainforest. Due to artificial destruction, the vegetation has been degraded to savanna bamboo forest and savanna banana forest. Farmlands are rare, so the vegetation is rarely degraded to shrub type. Floodplain shrub is a disclimax community. It is a relatively stable type under influences of periodical river water fluctuations. Vegetation succession in the mountain slope section is as follows:

Restoration → Restoration →

Savanna bamboo or Savanna banana forest ⇄ Secondary humid rainforest ⇄ Humid rainforest

Interference ← Interference ←

(4) Vertical distribution of vegetation

In accordance with investigation and analysis, the area below the elevation of Chipwi section of Nmaihka River is covered with humid rainforest; that of 1000m to 1500m is covered with tropical monsoon forest; that of 1500m to 2000m is covered with subtropical evergreen broadleaf forest; that of 2000m to 2400m is covered with warm temperate broadleaved deciduous forest; that of 2400m to 3000m is covered with temperate hemlock; that of 3000m to 3500m is covered with boreal spruce-fir forest; that of 3500m to 5500m is covered with cold temperate shrub and alpine meadow; that of above 4500m is covered with snows. Vertical change of project influence area is as follows: the vegetation of 10m to 20m above the river surface is mainly benchland scrub-grassland, above which are tropical monsoon forest, evergreen broadleaf forest and savanna bamboo forest in the embedded distribution. Vertical distribution of vegetation type in the appraisal area is shown in Figure 5.3-1.

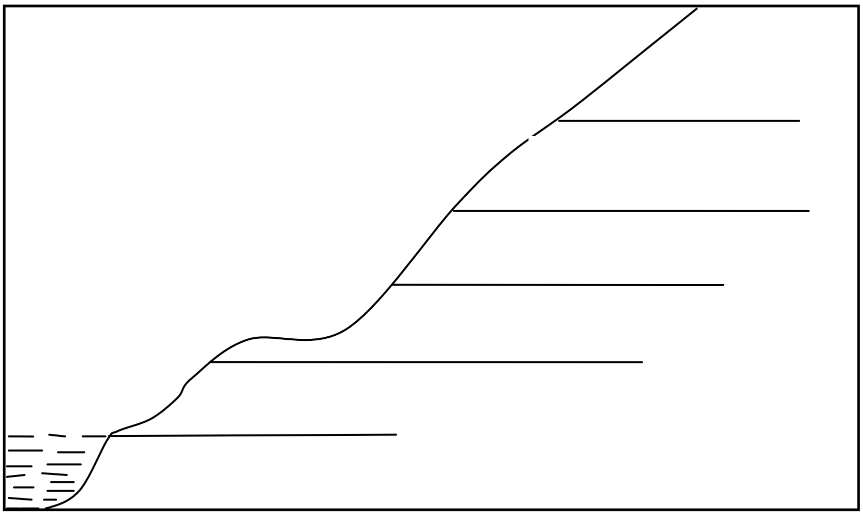


Figure 5.3-1 Diagram for Vertical Distribution of Vegetation Type in Chipwi Section of NmaihkaRiver

(4) Horizontal distribution of vegetation

Under the influence of altitude, human disturbance and other factors, horizontal distribution of vegetation is complex in the area. But the dipterocarpaceae – based tropicl rainforest is the zonal vegetation. Dominant species of secondary forests depend on specific areas; composition of the savanna bamboo forest also depends on specific areas; in terms of stand composition, for the reason of altitude and humidity, there are more large palm plants in the high-altitude area while areca triandra and other palm plants are more in the low-altitude area. Due to seasonal rise and recession of river water, floodplain plants grow on river shores and beaches, such as syzygium jambos, salix leaf pungent litse fruit, rapanea neriifolia, eurya japonica, homonoia riparia and so on.

(5) Rare or endangered plants

According to the investigation, in Chipwi section of Nmaihka River are rare or endangered species listed in the IUCN Red List, including tetrameles nudiflora, aquilaria malaccensis, bhesa robusta, dipterocarpus retusus, stellatum, cephalotaxus mannii, dipterocarp, taiwania cryptomerioides and bretschneidera sinensis. In addition, there also are scattered cyatheaceae and orchid plants listed in CITES appendix.

In accordance with general status investigation, ecological environment is good in the area. Local plants mainly include native plants and local indigenous plants. Due to human intrusion of native vegetation and plant resources, the vegetation has a clear secondary nature.

Table5.3-2 Rare and endangered species found in the project area

family	species	IUCN Category	elevation	G P S	Location and number
Thymelaeaceae	*Aquilaria malaccensis* Lam.	VU/ A1cd	＜270m	N26.01.978; E098.10.709; Ele.332m	The roadside from Phala to SawLaw, Chibwe. few
Anacardiaceae	*Mangifera sylvatica*	LR/lc	600-1900 m	N26.19.564; E098.20.349; Ele.1097m	From Chuangmaw to Kyithtan,Chibwe，east side of Nmai Hka，1tree
Celastraceae	*Bhesa robusta* （Roxb.） Ding Hou	LR/lc	50-500 m	N25.56.998, E098.08.926, Ele.250	From Phala to Chibwe，1tree
Cephalotaxaceae	*Cephalotaxus griffithii* Hook. f.	LR	1100m		Chibwe
Taxodiaceae	*Taiwania cryptomerioides Hayata*	VU/ A1d			Chibwe 、Khaunglanphu
Ericaceae	*Craibiodendron stellatum*	LR/lc	（200–）700–1600（–2700）m	N26.09.211; E098.16.221; Ele.1670m	From SawLaw to Phala, near SawLaw，Chibwe east side of Nmai Hka, 3 trees

5.3.2Terrestrial animals

(1) Species of terrestrial animal

In Chipwi section of Nmaihka River, wildlife resources are abundant, including 6 orders, 18 families, 32 genera and 41 species of mammals; 18 orders, 56 families, 136 genera and 318 species of birds; 2 orders, 5 families, 13 genera and 13 species of reptiles; 1 order, 4 families, 11 genera and 14 species of amphibians; 11 families, 125 genera and 216 species of butterflies.

In accordance with survey statistics and query, there are 39 rare and endangered species in the area, including 18 species of animals, 16 species of birds, 3 species of amphibians and reptiles and 2 species of butterflies. A total of 28 species are included in the IUCN Red List, including 18 animal species and 10 bird species; a total of 30 species are include in the CITES Appendix, including 17 animal species, 8 bird species, 3 species of amphibians and reptiles and 2 species of butterflies.

Table 5.3-3 Wildlife Fauna Composition in Chipwi Section of NmaihkaRiver

Category	Family	Genus	Species	Rare and Endangered	IUCN	CITES
Animals	18	32	41	18	18	17(17)
Birds	56	136	318	16	10	8(2)
Amphibians and reptiles	9	24	27	3		3

Butterflies	11	125	216	2		2

Note: (17) indicates that there are 17 species included in the IUCN Red List.

Due to human disturbance and frequent hunting, there are rare large wild animals near the project area where are mainly monkeys, snakes and other small wild animals.

Table 5.3-4 Preliminary List of Mammals of Chibwe Area, Kachin, Myanmar

SPECIES					EVIDENCE			STATUS	
NO.	**ORDER**	**FAMILY**	**SCIENTIFIC NAME**	**COMMON NAME**	**Body**	**Sign**	**Info.**	**IUCN**	**CITES Appendix**
1	**EULYPOTYPHLA**	Soricidae	*Suncas sp.*	Shrew	√				
2		Talpidae	*Parascaptor leucurus*	White-tailed Mole	√			LC	
3	**PRIMATES**	Lorisidae	*Nycticebus bengalensis*	Slow Loris	√			VU	I
4		Cercopithecidae	*Macaca mulatta*	Rhesus Macaque	√	√	√	LC	II
5			*M. assamensis*	Assamese Macaque	√	√	√	NT	II
6			*M. arctoides*	Stump-tailed Macaque	√		√	VU	II
7			*Trachypithecus shortridgei*	Shortridge's Langur	√		√	EN	I
8		\Hylobatidae	*Hoolock leuconedys*	Eastern Hoolock Gibbon	√	√	√	EN	I
9	**PHOLIDOTA**	Manidae	*Manis pentadactyla*	Chinese Pangolin	√	√	√	EN	II
10			*M. Jacanica*	Sunda Pangolin		√	√	EN	II
11	**CARNIVORA**	Ursidae	*Selenarctos thibetanus*	Asian Black Bear	√	√	√	VU	I
12			*Helarctos malayanus*	Sun Bear	√	√	√	VU	I
13		Mustelidae	*Martes flavigula*	Yellow-throated Marten	√			LC	
14			*Melogale personata*	Ferret Badger	√			DD	
15		Viverridae	*Viverra zibetha*	Large Indian Civet	√	√	√	NT	
16			*Viverricula indica*	Small Indian Civet	√	√	√	LC	
17			*Paradoxurus hermaphroditus*	Common Palm Civet	√			LC	
18			*Paguma*	Masked Palm Civet	√	√	√	LC	

			larvata						
19		Felidae	*Catopuma temminckii*	Asian Golden Cat	√			NT	I
20			*Prionailurus bengalensis*	Leopard Cat	√	√	√	LC	II
21			*P. viverrina*	Fishing Cat	√	√		EN	II
22			*Neofelis nebulosa*	Clouded Leopard	√	√	√	VU	I
23	**ARTIODACTYLA**	Suidae	*Sus scrofa*	Wild Boar	√	√	√	LC	
24		Moschidae	*Moschus berezovskii*	Forest Musk Deer			√	EN	II
25		Cervidae	*Muntiacus vaginalis*	Red Muntjac	√	√	√	LC	
26			*M. feae*	Fea's Muntjac	√	√	√	DD	
27			*Rusa unicolor*	Sambar	√	√	√	VU	
28		Bovidae	*Bos gaurus*	Gaur	√	√	√	VU	I
29			*Budorcas taxicolor*	Takin	√	√	√	VU	II
30			*Capricornis milneedwardsii*	Chinese Serow	√	√	√	NT	I
31			*C. rubidus*	Red Serow	√	√	√	NT	I
32	**RODENTIA**	Sciuridae	*Callosciurus quinquestriatus*	Strip-bellied Squirrel	√			NT	
33			*Tamiops maclellandi*	HimalayanStriped Squirrel	√			LC	
34			*T. swinhoei*	Swinhoe's Striped Squirrel	√			LC	
35			*Dremomys rufigenis*	Red-cheecked Squirrel	√			LC	
36			*D. pernyi*	Pernyi'sLong-nosedSquirrel	√			LC	
37		Pteromyidae	*Petauris philippensis*	Indian Giant Flying Squirrel	√	√		LC	
38			*P. sybilla*	Small Orange-back Flying Squirrel	√				
39		Spalacidae	*Rhizomys pruinosus*	Hoary Bamboo Rat	√	√	√	LC	
40		Hystricidae	*Atherurus macrourus*	Brush-tailed Porcupine	√	√	√	LC	
41			*Hystrix brachyura*	Malayan Porcupine	√	√	√	LC	



Mammals



Amphibians and reptiles



Birds and Butterflies

(2) Type of terrestrial animal habitat

1) Type of terrestrial mammal habitat

a. Seasonal rainforest

Under direct influence of warm and wet flows brought by southwest monsoon of Indian Ocean, the seasonal rain forests is widely distributed on the valley bottom. As a climax vegetation community in northern mountains, it is distributed in mountains from both sides of rivers and streams to the altitude of 600 to 800m. Myitsone is located in the transition area between northern mountains and middle plains, where the terrain is flat, river and valley are wide, low hills are dominant and there is a large area of such habitats. Based on niche differentiation, wild mammals distributed in seasonal rainforests of Myitsone can be classified into the following habitat types.

Canopy habitat type: such wild animals rely on canopy of tall trees and spent most of the life on it. Some endangered primate species distributed in Myitsone are typical under the type.

Ground or semi-ground habitat type: such wild animals spend most of the life on the ground in the forests. In addition, some are good at climbing trees for foraging or hunting, for nesting in a tree or for resting in a tree. They have alternating activities on the ground and trees.

Fossorial type: such animals adapt to underground life. Most species under pholidota and rodentia have a habit of dwelling in caves, but they also can forage on the ground and rest in tree holes. For the reason, they also belong to self-fossorial type.

Valley semiaquatic type: otters and fishing cats mainly live in forests on both sides of the valley. They depend on water and their food sources include fishes, arthropods and mollusks in the water. In addition, they also live on forest ground near the water to conduct rest, marriage and other acts. Some species have no foraging in the water, but they like to conduct waterside activities, including artiodactyla red deer, Indian bison and so on.

b. Mountain forests

Mountain forests are generally distributed between 800m and 200m of altitude. Based on ecology habit, wild animals in the habitat could be classified into four distribution types. Several primates under tree-dwelling type all can live in the habitat.

c. Wetlands and rivers

Few animals rely on wetland ecosystems and fewer ones live in the investigation area. Only red deer and Indian bison often live in wetlands. Other small animals may live in the habitat, but most of them don‘t rely on such single habitat patch.

2) Type of bird habitat

a.Rivers and waters

River ecological system presents a uniform phenonemon of distributing like strips in verticial direction. Verticial alternation of species doesn’t evenly and continuously change. Special species occur again in the whole rivers like Phalacrocorax carbo； Birds acting in this district are mostly those that have special morpholigical structures suitable to ecological environments under rapid rivers, for example, several kinds of dovetails act in NmaiKhaRiver at the confluence of two rivers.

Goose and duck species are mainly distributed in lower stream of confluences between two rivers, and sparsely distributed in upper stream. Larus ichthyaetus and Larus brunnicephalus often act in rivers. Ciconiiformes species and Anhinga melanogaster prefer habiting on tranquil and smooth river surface. Alcedo atthis and Megaceryle lugubris often habit in twigs or stone edges nearby rivers. Charadrius dubius like habiting in river beaches and pebble beaches. Rhyacornis fuliginosus prefer living in regions along the banks of rivers with a large amount of loose stones.

b.Wetlands

Wetland is transitional zone between lands and waters and equipped with rich resources related to land and aquatic animal and plants. Amaurornis phoenicurus often hunt for foods in streams and rivers on banks of this watershed, farmlands and wetlands. Birds under Ardeidae mostly habit in wetlands and forest areas nearby waters. Birds under Motacillidae frequently occur in wetlands of foramlands and along banks of rivers. Shorebirds often hunt for food in wetland environment along rivers. Dovetails mainly choose wet environment of streams storing water as its habitate.

c.Ecological environment of shrub grasslands

Shrub grassland refers to a plant community where mesophytic or xerophytic mesophytic perenniall herbaceous plants are taken as dominant species with a sparse distribution of shrubs. Shrub grassland is mainly distributed on both banks along rivers and nearby villages and farmlands. Campephagidae, Emberizidae and Sylviidaeunder Passeriformes often choose shrub grasslands as their habitating environment, mainly living in middle and lower part of open forests on mountain feeet and shrubs; Birds under Ccuculiformes often habitate on top of high shrub forests.

d. Villages－farmlands ecological system

Land resources from Myitkyina extending to Myitsone sections are relatively distributed evenly and suitable for settled agricultures, villages often develop toward even distribution; hills and mountainous areas cover a large area in north of Myitsone, and villages mostly are centralized valleys, mountain feet and edges of mountain feet. Birds depending on this ecological system mainly include crow, Passer montanus, Psittacula finschii and birds under Sturnidae.

e.Mountainous secondary forests

Secondary forests refer to those that are naturally formed after virgin forests lose original forest environments due to unreasonable cutting, deforestation, fire disaster and shifting cultivation activities and are replaced by various secondary communities. Mountainous

secondary forests in evaluated area are mostly yound and middle-aged forests, often taking broad-leaved species as dominant species. Birds under Falconiformes often choose mountainous secondary forests as their habitats, frequently seen in mountains, plains, mountain feet and hilly lands.

3) Type of reptile habitat

a. River and riverbank zone

The zone includes the areas which are located near NmaihkaRiver and its banks and largely affected by river water. Reptiles include testudinata, sauria and serpentiformes. Reptile species are less in the zone. There are more species with high adaptive capacity and it is easier to find them.

b. Residential area, farmland and trunk road zone

It mainly includes residential areas, farmlands, orchards, vegetable plots, grasslands, highroad and other areas subject to relatively large human disturbances. There are more species and number of reptiles mainly including saurian and snakes. Due to relatively large human disturbances, species and number of reptiles have a larger change.

c. Small tributary, creek and spring zone

The zone mainly includes streams, creeks and springs, where reptiles are more in the species and number. Except the saurian in residential area, most reptiles can be found in the zone.

d. Hillside and forest zone

The zone is higher, far away from rivers and covered with dense trees and shrubs. Main reptiles include saurian, testudinata and serpentiformes. With the better hiding conditions, they can not easily be found.

4) Type of amphibian habitat

a. River and riverbank zone

The zone includes the areas which are located near NmaihkaRiver and its banks and largely affected by river water. Amphibian species are less in the zone. Most of the species are highly adaptive and larger in the number. It is easier to find animal population of above 10,000.

b. Residential area, farmland and trunk road zone

It mainly includes residential areas, farmlands, orchards, vegetable plots, grasslands, highroad and other areas subject to relatively large human disturbances. There is a few of amphibian species largely affected by human disturbances. For the reason, species and number of amphibians follow a large change.

c. Small tributary, creek and spring zone

The zone mainly includes streams, creeks and springs, where amphibian distribution is the most concentrated. It is far more than any other zone in the species and number of amphibians. Almost all amphibians in Myitsone area could be found in the zone.

d. Hillside and forest zone

The zone is far away from water and covered with dense trees and shrubs. With the better hiding conditions, they can not easily be found.

5.3.3 Aquatic organisms

Investigation of NmaihkaRiver obtained 26 fish species under three orders and four families, including eighteen species under two families of cypriniformes, seven species under one family of siluriformes and one species under one family of anguilliformes.

Fishes above Chipwi section of NmaihkaRiver mainly include schizothorax, pareuchiloglani,

glyptothorax and pseudecheneis adaptive to rapids habitat. Fewer fish species are adaptive to slow flows. The river section below Chipwi is in the transition zone between cannon river and plain river and its water follows characteristics of cannon river and plain river, where aquatic organisms are rich and fish species also follow characteristics of upstream and downstream species.

With low utilization of fishery resources, single fishing method and simple operating tool, Chipwi section has no professional fishermen. Common fishing species include schizothorax meridionalis, mahasher and garra qiaojiensis.

ChipwiRiver is the largest tributary of NmaihkaRiver on the left bank. In accordance with analysis of habitat, schizothorax, pareuchiloglanis, glyptothorax and pseudecheneis of fishes may be available in ChipwiRiver.

(1) Life history of fish

1) Reproduction habits

Based on the collected records about relevant fish habits and analysis with related species, a vast majority of species in the surveyed regions are fishes laying sticky, sinking types of eggs. For these species, their reproductive migratory distances are normally short and reproduction naturally completes in habitats. For prespawing migration, they generally move upward along the trunk for a short distance to lay eggs on flowing shoals with different bottom sediments or enter nearby mountain streams and lay eggs along them. Schizothorax, pareuchiloglani and catfishes mostly lay eggs in water environment of trunk and tributaries.

2) Feeding habits

According to the major food composition for fishes, fish feeding habits in surveyed regions are mainly divided into four categories: periphytic algae feeding habit, benthic invertebrate feeding habit, omnivorous feeding habit and piscivore feeding habit.

①Fishes which mainly feed on periphytic algae. These kinds of fish generally have wide oral fissure, sharp horny in front edge of mandibular, and adapt to the way of feeding algae growing on stones by scraping, e.g., Labeoninae, Schizothoracinae and Cobitidae.

② Fish which mainly feed on benthic invertebrate, e.g. some species under Sisoridae, Schizothoracinae and Siluridae. Their mouths often have well-developed tentacles or hypertrophic lips used to absorb food. Regarding the intaken food, except only a small part of food are Chironomidae larvae and Oligochaetes growing in deep pools and tranquil flow sections, a majority of food are larvae or nymphs under Trichoptera, Plecoptera, and Ephemeroptera growing between gravels in rapid flows and stone cracks in rivers. The proportion of this type of fish species is comparatively large.

③Omnivorous fish. They both feed on benthonic animals, aquatic insects, and residues and seeds of algae and plants. For example, small fishes like Osteobrama belangeri, Amblypharyngodon atkinsonii, Rasbora, Barbinae.

④ Piscivore fish. They are fierce and mainly prey on other small fishes. For example, Bagarius yarrelli , Channa aurolineata, Wallago attu, Raiamas guttatus.

Overally speaking, feeding habits of fishes have close connection with biological basis of baits in this region, showing that fishes specifices composition has a high relevancy with flowing environmental features in sections of Myitsone section.

3) Migration habits

① Diadromous fishes. Combining the field survey and literature findings, the results show that no fish species laying eggs anadromously are distributed in Nmaihka river section. But

based on the market survey made to Machanbaw, Anguilla bengalensis and Anguilla nebulosa have typical catadromous and reproductive characteristics. The spawning sites are in the deep-sea waters of Indian Ocean, and the laval migrate into fresh water hunting for baits and fattening.

② Potamodromous fishes. This type of fish usually refers to those that complete entire life cycle in freshwater, but the feeding grounds and spawning grounds are relatively far from each other. Thus during different life stages, they should have regular migration. For fish species living in the rivers, its larval fish have a weak ability to defend streams, and are often carried and dispersed with water, flowing into downstream for hunting for baits and fattening, which constructs a significant adaptability for the proliferation and growth of species. However, fishes of different spawning types have a quite different migration distance. As for the fish living in open water area and laying pelagic eggs, for example, Four Chinese Carps and Coreiusheterodon, Coreius Guichenoti and other species, the fertilized eggs often drift hundreds of kilometers away with the water. But for the species which lay sticky sinking eggs along coastal waters, since they stay at early developmental stages in slow or static water, the spreading distance is relatively short. During this survey, no pelagic eggs are collected.

③ Fresh water sedentary fishes. These fish species are usually wildly distributed in freshwater area. They are commonly small in size and lay sticky sinking eggs along coastal waters. Ecological environment range of completing their life cycle is relatively small, thus they can complete total life cycle in partial sections of still or slow waters.

④ Amphidromous fishes. This type of fish has the characteristic of adapting a wide range of salinity, consequently distribute wildly in coastal waters, esuaries and freshwater. But analysis from their breeding habits, there is no need for them to migrate between fresh and salt water to complete their life cycles in all aspects.

4) Habitat selection

ChipwiRiver is a mountain steam type of river. Its water level can sharply rise after rainstorms and then quickly fall. Bedrock or gravel is distributed on the bottom. ChipwiRiver is shallow and low in the content of suspended matters so the people can see the bottom. Due to small flow, water transportation is at a lower level, so the river bottom is relatively stable. There are more deposition of rotted terrestrial plant leafs in stone gaps where aquatic hold plants, zoobenthos and periphytic algae breed. Due to the lower water temperature, dissolved oxygen is often saturated. Small fish species adaptive to rapids are dominant, such as small species of cobitidae and barbinae.

(2) Major economic fish species and distribution

In accordance with the Investigation and Evaluation of Aquatic Organisms for Upper Ayeyawady, fishes of large sample size in the investigation of economic fish resources include Bangana pierrei, mahasher, Bangana delvdevi, barbodes hexagonolepis, schizothorax meridionalis, garra qiaojiensis and neolissochilus stracheyi. In addition, there is also a certain number of Indian glassy fishes, amblypharyngodon atkinsonii, tor tambroides and Myanmar crossocheilus latius.

Economic fishes in Chipwi section of NmaihkaRiver manly include neolissochilus stracheyi, schizothorax meridionalis, mahasher and garra qiaojiensis. Fish sample properption in total samples, length range and weight range are shown in Table 5.3-3. As shown from the table, schizothorax meridionalis fishes are potentially important fishing targets with the weight of above 1000g; mahasher and garra qiaojiensis fishes are relatively small but more, so they have a certain economic value.

Table 5.3-4Length and WeightRange of Major Economic Fish Species

	Sample size	Proportion	Length Range (mm)	Weight Range (g)
Mahasher	72	6.62%	90-265	11-347.8
Schizothorax meridionalis	31	2.85%	82-425	8.3-1312.7
Garra qiaojiensis	31	2.85%	123-209	39.7-208
Neolissochilus stracheyi	28	2.58%	103-550	18.1-4000

5.4 Social environment

5.4.1Socio economy

(1) Administrative division

KachinState is an autonomous state of Kachin in the northeast of Myanmar. It borders on NujiangLisuAutonomousPrefecture and Dehong Dai and JingpoAutonomousPrefecture in YunnanProvince and adjacent to Changdu of Tibet Autonomous Region on the north. KachinState covers an area of 89,000 km^2 accounting for 13% of total Myanmar area, including three counties of Myitkyina, Bhamo and Putao and 18 Town cities.

(2) Population

With the total population of about 1.42 million and the population density of 15.9 persons km^2, KachinState is at the lowest level in Myanmar. In plains such as Bhamo and Mogong towns, the population density is 40 to 45 persons / km^2. Capital of KachinState, Myitkyina, has a population of about 200,000. The population sex ratio in Kachin is female 60% : male 40%.

(3) Nation

In the KachinState, there are primary Kachin and its 11 branches (Jinghpaw, Lachik, Dalaung, Lauwaw, Guari, Lisu, Rawang, Hkahku, Duleng, Atsi and Zaiwa) as well as Burman, Shan and other ethnic groups, hundreds of thousands of overseas Chinese and immigrants from India, Pakistan, Bangladesh and other countries. Most Kachin people live in the orth of kachin State. Burman, Shan and their branches mostly live along railways in Mandalay and Myitkyina. Some people of Shan and its branches also live in AyeyawadyRiver basin and PutaoBasin. A few Tibetan people live in the northernmost KachinState.

Official languge of KachinState is Burmese, but many people can speak English and Chinese. Local ethnic minorities have their own languages. Both Kachin and Shan use their own languages and characters.

(4) Agriculture

In KachinState, rice is an important crop, accounting for 75% of total planted area. Other crops are widely planted in Myanmar. Fishery is distributed in rivers and lakes. Farm cattle, yellow cattle, pigs and chickens are raised.

Agriculture is an economic pillar of KachinState and main crops include rice, sorghum, maize, sugar cane and rape. The total planted area is about 2308km^2, including farmland area of about 1417km^2, drylands 405km^2, flood land of 202km^2, garden area of 121km^2 and mountain land of 162km^2. Rich is an important crop mainly planted in plains and mountain lands, accounting for 75% of total planted area. Protected forestland area is about 5670km^2 in Mohnyin, Myitkyina, Bhamo, Shwegu and other towns. Forest products include teak, hardwood and other forest products. They are another main source of income.

(5) Industry

The most important industry in KachinState includes sugar refinery in NanmudiTown, small

rice mills and timber processing plants. Hand-weaving industry is widespread throughout the whole state.

In addition, jade and teak are also main sources of income. Jades are distributed in Hanba, Longqin and other places while teak is distributed in Bhamo and Myitkyina.

(6) Electric power

Small portion of the southern region is covered by main grid and most areas are powered by isolated grids. There are several small (micro)-type hydroelectric power plants, electricity supply is subject to serious shortage. Total generation is about 3.04 million kW • h. Electric lighting is available only in 15 towns and 15 villages. With small power supply and coverage of isolated grids, power supply cannot be guaranteed. For the reason, almost all enterprises and merchants have their own small diesel generators.

(7) Employment

As shown from International Labor Statistics Yearbook (2003) issued by the ILO, registered unemployed population reached 0.382 million, 0.398 million and 0.434 million respectively in 2000, 2001 and 2002. In accordance with statistics in 2003, the employment population is 26.36 million, including 16.29 million males accounting for 61.8% and 10.07 million females accounting for 38.2%, and the unemployment rate is 4.02%. Agricultural production accounts for 64.09% of total employment population, processing and manufacturing, mining, electricity, energy, construction and other industries account for 8.42%, service industries (including transportation, telecommunications, administration, tourism and other service industries) account for 10.12% and the business accounts for 9.75%.

5.4.2Religious belief and ethnic culture

(1) Religious belief

In KachinState, there are primary Buddhism and Christianity as well as Islam and Hinduism. Buddhism believers account for 57.8% and Christianity believers account for 36.4%. 614 Christian churches, 20 Islam churches, 48 Hinduism churches and many Buddhist pagodas are distributed in KachinState.

Buddhism has a broad and profound impact on aspects of social life in Myanmar. Current Myanmar society still has a strong Buddhist color. Almost all Buddhist families have shrines. Worshiping is an important life content. The believers chant sutras in the morning and at night. Schools and institutions set up temples or shrines. A number of people worship in famous Buddhist temples or pagodas in their rest days.

Buddhist temples have a great influence on Myanmar education. In the past, people worshiped and receive an education in Buddhist temples in villages or towns. Buddhist temples take classics for education textbook to provide religious education and language education in parallel. They still have a certain influence and take an important position on cultural education in villages and towns.

(2) Ethnic culture

Primary Kachin people mostly live in high mountains of 1500 to 2000m. To prevent fires, their houses are not connected. Most houses are thatched cottages divided into two layers of which the upper is for people and the lower is for livestock and poultry. All houses are rectangular with a gable roof.

There are more than 20 traditional festivals in Myanmar, most of which are related to Buddhism. Main traditional festivals include Songkran, Buddha Bathing Festival, Summer Festival, Hanukkah, Festival of Lights and Festival of Worship. There are also some festivals of ethnic minorities.

Manau Festival is the biggest and the most solemn traditional collective event of Kachin people. Thefestival is held once a year but it also could be hold timely based on needs. Permanent Manau altar was built in Myitkyina, Capital of Kachin State, in 1958. A state-wide Manau festival event is held in Myitkyina once every four or five years. For villages and tribes, Manau Festival is held once every year. During the Manau Festival, All Kachin people will wear festival coats to gather in a specified space for dancing and singing aloud with drum beats.

A number of Kachin people can speak English and Chinese. Most of local ethnic minorities have their own languages. Kachin and Shan use their own languages and characters.

5.4.3Land use

Agriculture (farming) is the most important industry of Myanmar but also the basis of the Myanmar economy. Based on agricultural land resources per capita, Myanmar is one of the richest Asian countries and takes the first position in Southeast Asia. As shown from statistics from 2000 to 2001, there are 10.4 million hectares of arable lands and 650,000 hectares of fallow lands, which amount to 11.05 million hectares with 0.2 hectares per capita; 8.46 million acres of arable wastelands with 0.16 hectares per capita.

Farming is the most important industry ofKachin State but also the economic basis of the KachinState. KachinState covers a land area of 89,000 km^2, including plains of 38.66% and mountains of 61.34%. Total planted area is about 568,000 acres, including 351,000 acres of farmlands, 99,000 acres of dry lands, 49,000 acres of flood lands and 30,000 acres of garden lands.

5.4.4Landscape and tourism

KachinState is rich in tourism resources. Bhamo and Myitkyina are major tourist cities in Myanmar. BhamoPajueMountains, Senge Benlan church and Myitkyina Wanling Pagoda are local famous attractions.

According to the survey analysis, construction of Chipwi Nge Hydropower Station does not involves local landscape and tourism resources.

5.4.5 Population health

Most Kachin areas are hot and humid so as to facilitate breeding of disease vectors and animals as well as pathogenic microorganisms. There are mainly insect-borne, food-borne and water-borne diseases.

Insect-borne diseases are the major diseases in Myanmar, mainly including malaria, Japanese encephalitis and Leishmaniasis. Spinal Chikungunya fever, dengue, filariasis, plague and typhus (forest) also occur. Malaria risk prevails in the area below an altitude of 1000 meters. It occurs in KachinState from March to December.

Main food-borne and water-borne diseases include cholera, dysentery, fasciolopsis buski, colon fluke, hepatitis, melioidosis and typhoid. Measles, diphtheria, influenza, poliomyelitis and other diseases also often occur.

Medical conditions are poor in KachinState where there are six hospitals of more than 100 beds, 21 hospitals of below 50 beds as well as small town hospitals and village clinics. A narcotics hospital is built respectively in Bhamo and Myitkyina. Economic backwardness and inadequate investment in health care costs seriously hamper the development of medical and health services and improvement of people health status.

5.4.6 Traffic

The land transportation of KachinState is rather poor, with only one railway.Myitkyina city is

an important transport hub in northern Myanmar. It is located in the northern end of Myanmar's North-South Railway, at a full distance of 542 km from Mandalay in the south, and a full distance of 1163 km from Yangon. The full distance of the highway from Myitkyina to Putao in the north is 365 km, from Myitkyina to Bhamo in the south, 187 km, from Myitkyina to Ledo of India in the west, 458 km. The distance of the Myitkyina-Jiamai section of the Myanmar-India Highway is about 200 km, and this section can be available for transport all the year round while the other sections can barely available for jeeps in dry seasons. Myitkyina city and China's Yunnan province have close contacts at border areas, and the main highways include Tengchong-Myitkyina Highway, Myitkyina-Chipwi-Panwa Highway, and Myitkyina-Chipwi-Pianma Highway.

The main navigable river for inland water transport is the AyeyawadyRiver. Myitkyina is the starting point of the AyeyawadyRiver shipping, at a full distance of 169 km from Myitkyina to Bhamo, with the width of river of 400m to 800m, and small ships can be navigable in flood period. The voyage distance from Bhamo to Mandalay is 510km, with the width of river of 800m to 1500m, ships below 400 t can be navigable all the year round.

MyitkyinaAirport is an important dual-use airport in northern Myanmar, with asphalt runways, equipment of communication navigation and night navigation. There are also airports at Bhamo and Putao. Normally, there are two flights per week from Yangon to Myitkina and Putao.

5.4.7 Education



There were 156 colleges and universities in 2007, with a highly uneven distribution. Educational opportunities in Myanmar are limited outside the main cities of Yangon and Mandalay. It is somewhat an obvious problem in KachinState. According to the 2002-2003 statistics, there were 1183 primary schools, 86 junior high schools and 41 senior high schools in KachinState.

5.4.8Mineral

Kachin Jades are produced in Pagan, Hanba, Duomo, Longqin and other places. In ManxiTown, BhamoCounty is Nanshanka gem site. HugongBasin produces a small amount of amber, gold can be washed in rivers. Salt wells are distributed in GamaiTown and HugongBasin.

5.4.9 Women

(1) Basic conditions of women

Sex ratio of population in Myanmar is 98.83: 100 and females are more than males. Kachin population is about 1,420,000, including about 850,000 women accounting for 60%. In traditional history, Burmese women enjoyed a high social and economic status and were equal to men in all key areas such as education, health, employment as well as social and political activities. 1947 and 1974 Myanmar Constitution reiterates the principle of gender equality and some legal policies also begin to concern maternity leave treatment of women and increases medical services for pregnant women. It is internationally recognized that the government

takes responsibility to eliminate injustice and discrimination against women. Myanmar has formally accepted this view. It signed the Convention Elimination of Discrimination against Women (CEDAW) in 1979.

(2) Status of women

Political rights of Myanmar's military government are controlled by males. Women are prohibited to join the army so that they are less involved in government affairs and impossibly take a high post. In the national voting assembly, women take a very small proportion of seats.

The status of women in the family is guaranteed basic and domestic violence is less. Within marriage, the husband is considered to be in the first position in the family. He takes obligations for his wife and children. The wife bears most of the housework, including child care and disposition of household finances. In case of divorce, father will take guardianship for boys while mother will take guardianship for girls. But children have the right to make their own decisions. As shown from CEDAW report, the mother generally takes care of all children. The male and female in the marriage are co-owner of the property. The spouse can own 1/3 of the other's property before marriage and 1/2 of property accumulated or increased after marriage, including the property given in the wedding and that obtained by common labor after marriage.

Myanmar laws support the economic status independence of women. They have equal rights to obtain lands and other properties. In bank loan application and signature of other contracts, women are equal to men. But women cannot obtain the same reward with men engaged in the same work. Myanmar Women's Affairs Coalition (MWAF) implemented microfinance for women to provide 8,608 women with Burmese Kyat 724 million of loans. In accordance with the CEDAW report, Myanmar Maternal and Child Welfare Association also gave a similar opportunity to provide more than 45,000 women with Burmese Kyat 180 million of loans to do small business or livestock farming.

(3) Organization of women

Independent women's rights organizations had not been allowed in Myanmar by 2007. Only some women organizations under government management serve as political speech right organizations of women.

Union of Myanmar Women's Commission (MNCWA) was founded in 1996. It is organized by the Secretary-General of the State Peace and Development Council to provide policy advices.

Union of Myanmar Women's Affairs (MWAF 2003) set up branches in all states to concern education, health, economy, culture, environment, violence against women, human trafficking, girls, women status rebuilding, national races affairs and legal affairs.

Myanmar Women and Children Welfare Association (MMCWA) was founded in 1991. It is a government organization mainly comprising enthusiastic volunteers to facilitate improvement of life and health conditions of women and children. The organization is distributed in 324 towns with 11,233 branches and more than 20 million volunteers. It focuses on health and education of women and children as well as loan assistance to poor women; it set up 91 prenatal and postnatal care centers for pregnant women; it also set up 1,344 preschool daycare centers.





(4) Rlight of women

Myanmar government failed to invest sufficient funds for health care so that individuals had to bear the medical expenses. More and more poor women cannot get the better medical services due to inability to pay for medical expenses.

5.4.10Indigenous people

Chipwi Nge Hydropower Station mainly involves remote and inaccessible areas. Most indigenous people are Kachin and Shan.

In the KachinState are Primary Kachin and 11 branches (Jinghpaw, Lachik, Dalaung, Lauwaw, Guari, Lisu, Rawang, Hkahku, Duleng, Atsi and Zaiwa) as well as Burmese, Shan and other ethnic groups. Most Kachin people live in the orth of kachin State. Burman, Shan and their branches mostly live along railways in Mandalay and Myitkyina. Some people of Shan and its branches also live in AyeyawadyRiver basin and PutaoBasin. A few Tibetan people live in the northernmost KachinState.

Kachin is the sixth largest ethnic group in Myanmar, with a population of about 1.3 million, accounting for 2.5% of the total population. It is mongoloid and similar to Burmese in human characteristics. Kachin have their own language as a branch of Sino-Tibetan Tibeto-Burmese Jingpo language. Their economic life is mountain agriculture-based. Their cattle, pigs and chickens are raised in courtyards. They also are engaged in hunting and fishing activities in the slack season. Weaving of bamboo articles is a traditional handicraft of Kachin. In addition to stoneware and iron, bamboo articles are widely used for Kachin production and living tools. And even bamboo tubes are used for cooking.

Shan is the second largest ethnic group in Burma, with a population of about 4.2 million, accounting for 8.5% of Myanmar's total population. Shan people are scattered to live in KachinState. Shan language is a Zhung-Shan-Dai branch of Sino-Tibetan Zhuang-Dong group. It is similar to Burmese in the character appearance. Due to long-term close contacts and exchanges in the history, Shan people are affected by Burmese in the mode of production and religious habits. Their economic life is agriculture-based and a few people also operate handicraft business or small businesses. Small handicraft industry can produce farm tools, household items, decorations, cloth, cooking utensils as well as mats, satchel, paper and dyed threads. Shan women's economic independence is strong. In production, men are responsible for plowing and ditch while women responsible for sowing and transplanting; in commerce, men transport cloth and grocery while women sell vegetables, fruits and snacks in the village bazaar. In the handicraft, the men repair houses and make furniture while women spin cotton

and weave cloth.

5.4.11Overview of project area

In the influencing area of Chipwi Nge Hydropower Station are main crops such as rice, wheat, corn, peanut, sesame, cotton, beans, sugar cane and so on; main fruits such as mango, pineapple, lemon, orange and coconut; main economic woods such as teak, green fruit trees, bamboo and so on.

In the project area, villagers generally live near riverside highways or rivers and mostly are concentrated in natural villages subject to different sizes. Each village has a specified head responsible for message transmitting. There is no clear boundary between villages.

Between the project area and the external are waterways and highways for communication. Due to large channel slope in the waterways, streams are fast-flowing so as to cause navigational hazards. There are a number of gold diggers on both bank of the river and ships in the river mostly provide services for the gold diggers. There are two highways to connect the project area with the external, namely Myitkyina – Chipwi highway on the left bank of NmaihkaRiverand Injangyang-Chipwi highway on the right bank of NmaihkaRiver. Their roadbeds can reach the maximum width of 5 to 6m and minimum width of 3 to 4m. Both highways are extended along the mountain form and they are poorly linear. They have an uneven clay bound macadam pavement which becomes muddy in summer and often suffers slough to beak the traffic.

In the project area, some villages are located along the above highways, some are connected with the above highways via branches to realize external transport and some have no highway but rely on waterways for external transport.

Infrastructure conditions are poor in the project area. There is no grid in the reservoir area and a few villagers generate power by using small diesel generators. Drinking water is generally drawn from stream ditches by gravity flow. Some villages build a reservoir in a high position and lead water to surroundings of households via pipelines. The pipelines are equipped with a tap to provide water for surrounding villagers. Some villages have water wells for villagers to carry water. There is no special facilities such as telecommunications and cable television in the reservoir.

In the project area, public facilities mainly include temples, churches, schools, hospitals and so on. Most villages provide Buddhist temples and God or Christ churches. They generally coexist. Some villages provide primary schools where kindergarten and grades of 1 to 4 are set up. Students need to learn in Myitkyina after graduation. A few villages are equipped with small hospitals.

5.5 Status of environmental quality

Entrusted by CPIYN, the Environmental Monitoring Station in Tengchong County, Yunnan Province of China monitored the water quality in sections of the dam site and power plant of Nmaihka River in October 2014. The results of surface water quality monitoring are shown in Table 5.5-1.

Table 5.5-1 Results of Surface Water Quality Monitoring in Project Area

Water Quality Index	Section Name		Environmental quality standards	Evaluation result	Standard limits of CPCB （Central Pollution Control Board of India）
	Dam site	Power plant site	Environmental quality standards for surface water of China GB3838-2002（III）		

pH	7.49	7.28	6~9	III	5.5-9.0
BOD	2	3	≤4	III	30.0
COD	6	7	≤20	III	250
TSS	18	20	—	—	100
Oil	0.04	0.04	≤0.05	III	10.0
Phenol	0.002	0.002	≤0.005	III	1.0
Cyanide	0.004	0.004	≤0.2	III	0.2
TN	0.227	0.365	≤1.0	III	50.0
TP	0.027	0.026	≤0.2	III	5.0
Arsenic	0.007	0.007	≤0.05	III	0.2
Chrome	0.009	0.013	≤0.05	III	2.0
Mercury	0.0001	0.0001	≤0.0001	III	0.01
Zinc	0.05	0.05	≤1.0	III	5.0

Because the surface water quality standards has not been collected from Myanmar, we refer to China "surface water environment quality standard" (GB3838-2002) for the evaluation of surface water. ClassIII is mainly suitable forlevel 2of centralized drinking water protection zones, which is mainly suitable for drinking water, fish and shrimp wintering grounds, migration routes, aquaculture zones, swimming area, etc.

As shown from Table 5.5-1, all water quality indexes are within the limit of China "surface water environment quality standard" (GB3838-2002) class III. According to the monitoring results, the water quality of both sites is quite good and can meet " Environmental quality standards for surface water "(China, GB3838-2002) .

From Table 5.5-1, we can find that the limits of china surface water environment quality standard are much lower than CPCB which come from BANCA. For some index's limits, such as BOD, COD, Oil, etc, CPCB is some kind of wastewater discharge standard rather than water environment quality standard.

According to the investigation, there is no medium and large -sized mining enterprise or industrial pollution source near ChipwiRiver. Ambient air quality and sound quality are better in the area.

5.6 Main environmental problems

(1) Serious ecological damage

Wood is a main income source of northern Myanmar and KachinState. Continuing deforestation causes serious damage to forest resources and sharp decline of forest coverage.In addition, local residents are accustomed to migration type shifting cultivation and obtain slope farmland by burning and rotation of crops, which directly causes damage to vegetation in large area and even leads to forest fires. To obtain a livelihood, some residents have to engage in wildlife hunting and trading activities so that wildlife suffers a huge threat and rare or endangered animals become reduced sharply. Deforestation, slash-and-burn cultivation, wildlife trading and other human activities cause a large impact on ecology in the area so that ecological degradation in local area becomes serious.





Logging Slash-and-burn Cultivation

(2) Economic development and people's livelihood to be improved

Myitsone area is remote and its infrastructures need to be developed. Due to limitation of capital and other conditions, local resources and related industries cannot develop properly. In particular, abundant water resources are not exploited. Due to scattered residence of local population, economic and cultural exchanges are less and regional economic development is very restricted. Most people's living standards need to be improved.





Infrastructure conditions need to be improved.



PEOPLE's living standards need to be improved

5.7 Environment trends analysis of project zero

This section aims to analyze change trend of regional natural environment, ecological environment and social environment of the project area following established economic and social development goals under the premise of no construction of Chipwi Nge Hydropower Station, that is, analyze change trend of environment and development in the appraisal area under the premise of project zero.

5.7.1 Natural environment

(1) Hydrological regime

In case of taking project zero, the hydrological regime will not be changed significantly in the project area. Water level, flow, velocity, direction and other hydraulic elements will maintain the status in time and space. Runoff is almost consistent with rainfall in annual change. Uneven annual distribution still exists and declines gradually from the upstream to the downstream. The water level changes with flow rate. In summer, runoff reduction causes river water level drop and river surface narrowing; in rainy season, water level rises to widen the river surface.

Under the influence of rainfall and climate, sediment yield in the basin increases from upstream to downstream. Under the premise that human activities, population distribution and ground vegetation coverage has little change, sediment yield changes slightly and follows the trend of increasing from upstream to downstream.

(2) Water environment

Under current conditions, both sides of ChipwiRiver are sparsely populated and have no large industrial and mining enterprises. For the reason, there are few pollutants into the river and current water quality is relatively good.

In case of taking the Project Zero, farming will grow with economic and social development in the project area but surface source pollutants will increase to some extent. Due to limited local level of technological and economic development, traditions and mountainous terrain conditions, farming mode and planted area change at a low level. Even if surface source pollutants increase, the change will still be relatively small. The population and domestic wastewater discharge in the project area will increase, but the pollutants into the river will remain at a low level due to scattered population. Industrial development in the project area will almost maintain the status quo and industrial pollution sources will not increase. It can be clearly seen that, economic and social development contribution to pollutants is at a lower

level and increase of river pollutants will not change water quality of the river.

5.7.2Ecological environment

(1) Vegetation change trend

Due to intense human activities over the past few decades, most tropical rainforests have been destroyed. Savanna bamboo forest, tropical monsoon forest and evergreen broad-leaved forest dominated by kapok, male bamboo, duabanga grandiflora, kapur and balau have been significantly secondary in the vegetation.

In case of taking the Project Zero, firewood and house building materials for local people‘s livelihood will have to rely on deforestation if no stable power supply is available. In order to obtain family incomes, some residents will have to engage in timber harvesting and trading so as to cause damage to forest resources. High mountains and deep valleys are more while flat ground is less in the project area. Local residents will continue to obtain farmlands by burning and rotation so as to directly cause damage to vegetation in large area. These human activities will lead to further reduction of forest vegetation area in the appraisal area and enhance degradation of vegetation succession. Main vegetation types generally will not change in the project area.

(2) Trend of terrestrial animals

With high forest coverage, inaccessibility and small population density, habitats suitable for terrestrial animals are widely distributed in the project area. In case of taking the Project Zero, mobility of the population will increase with economic and social development to generate some interferences to the habitats so that some animals will migrate to high altitudes. But the influence is at a low level. Animal species diversity will continue to maintain a high level and local environmental conditions will be still suitable for terrestrial animals to thrive.

In addition, due to lack of large-scale industrial enterprises, modern agriculture, mature services and other living means, some residents will have to engage in wildlife hunting for obtaining family incomes by trading of wild animal fur, bones and meat so that wild animals suffer a huge threat, which will result in reduction of rare and endangered animals and affect biodiversity.

(3) Trend of fish resources

In case of taking Project Zero, fishermen will fish mainly in NmaihkaRiver and generate littler interference to ChipwiRiver. As long as water and sediment conditions have no large change in the basin and habitats of fishes are not changed significantly, fish resources of ChipwiRiver will continue to remain in a natural state and there will be no disappearance of species and significant decline of resources.

(4) Trend of ecological environment quality

In case of taking the Project Zero, deforestation, slash-and-burn cultivation, wildlife trade and other human activities will increase with economic and social development in the basin. Their interferences on ecological environment also will increase and local ecological environment will be further degraded. Due to limitation of local economic and technological development and social environment, the intensity of human activity will be limited to improve. The ecological environment in the area will continue to follow typical characteristics of forest ecological system and the overall ecological environment quality will be in a better state.

5.7.3Social environment

Due to limitation of national economy foundation and other instable factors, economic and technological develop is slow, living standard is at a low level, science ,culture and hygiene, road transportation, water conservancy facilities and other infrastructures are weak and

residents still retain more primitive lifestyle of slash-and-burn cultivation. In addition, due to historical reason, local residents are distributed in the project area of Chipwi Nge Hydropower Station by ethnic community. All ethnic groups retain their own culture and customs and have less economic and cultural exchanges between them.

In case of taking the Project Zero, if no comprehensive planning is carried out for the Chipwi River basin, local residents will continue to remain their own the original production and lifestyle so that it will be difficult to fundamentally change the above economic backwardness and slow social development.

5.7.4Comprehensive analysis

In summary, if the project area of Chipwi Nge Hydropower Station fails to change existing economic development mode, eliminate the production and lifestyle of logging, slash-burn cultivation, hunting and gold washing or strengthen environmental protection and management, ecological environment of local area will further be degraded, local residents will continue to live in poverty and it will be difficult to fundamentally change slow economic and social development in a short term.

6 Environmental Impact Assessment (EIA)

6.1 Hydrological regime

Normal pool level of Chipwi Nge Hydropower Station is 740m. The capacity of reservoir below normal pool level is about 789,000 m^3. The reservoir has the ability for daily regulation and it is a channel reservoir. The reservoir covers an area of about 0.10km^2 and its backwater length is about 0.75km.

After the reservoir retains water, flow rate will decline and the water level at dam site will be about 30m above natural channel so that water surface area and water width will increase. Due to small reservoir capacity, the increase will be at a low level. With daily regulation capacity, the reservoir is rapid in water exchange. Its water level changes between 735m and 740m with an amplitude of 5m.

Chipwi Nge Hydropower Station is a low-dam diversion hydropower station. Annual average flow rate at the dam site is 40.1m^3/s while power generation takes about 27m^3/s. After the project is completed, a water reduction section of about 15.7km long will be generated between the dam site and estuary. In accordance with site survey, scattered settlements are distributed on both sides of the section from the dam to estuary. The settlements have a large height difference and distance from ChipwiRiver. Local residents take living water mainly from nearby streams or springs rather than ChipwiRiver. The water reduction section has no requirements for irrigation and water supply. To maintain basic ecological requirements for the river and meet construction power loads of Myitsone and Chipwi power plants, the power plant shall discharge some ecological flows. There are more branch gullies in the downstream of the dam and the water connecting amount is larger, discharged flow of Chipwi Nge Hydropower Station will take 10% of minimum monthly average flow in the dry season, namely 0.53m^3/s. Proposed discharged ecological flow of the dam is 0.53m^3/s.

Day-by-day comparison of downstream natural flow and discharged flow in high flow year, normal year and low flow year is shown in Figure 6-1 to 6-3. Downstream flow changes in different hydrographic years are shown in Table 6.1-1. From May to October, the natural flow is large. Diversion power generation has little impact on downstream flow and downstream water level changes slightly. From November to next April, natural reservoir inflow declines and diversion power generation significantly reduces downstream flow. The downstream flow is discharged ecological flow, namely 0.53m^3/s and downstream water level falls. With abouchement of streams from many downstream branch gullies, flow of water reduction section will gradually increase so that the downstream flow and water level will gradually reduce difference from natural conditions.

As shown from the investigation, the nearest two branch gullies are about 1.6km in the downstream of the dam, respectively with a catchment area of 10.0km^2 and 5.45km^2. According to estimates, their annual average flows are respectively 0.73m^3 / s and 0.4m^3 / s. Plus discharged flow of 0.53m^3/s, average flow 1.6km in the downstream can reach 1.66m^3/s. Annual average flow of confluence between the dam site and estuary is about 13.9m^3/s. Plus discharged ecological flow, the flow at the estuary of Chipwi River can reach 14.4m^3/s, accounting for 26.7% of annual average flow at the estuary of Chipwi River.

Table 6.1-1 Dam Site Flows in Hydrologic Years before and after Project Completion Unit: m^3/s

Month	25%			50%			75%		
	Natural Flow	Water Diversion Discharge	Discharged Flow	Natural Flow	Water Diversion Discharge	Discharged Flow	Natural Flow	Water Diversion Discharge	Discharged Flow
1	14.38	13.85	0.53	10.28	9.75	0.53	9.76	9.23	0.53
2	11.82	11.29	0.53	10.29	9.76	0.53	7.74	7.21	0.53
3	9.19	8.66	0.53	11.51	10.98	0.53	4.92	4.39	0.53
4	7.43	6.90	0.53	17.37	12.09	5.29	3.88	3.35	0.53
5	9.41	8.29	1.12	14.85	14.08	0.78	36.55	18.71	17.84
6	86.21	26.23	59.98	92.38	26.69	65.68	85.56	26.15	59.41
7	112.81	27.18	85.63	118.61	27.18	91.42	102.40	27.18	75.21
8	112.22	27.18	85.03	84.50	27.18	57.32	58.33	27.18	31.15
9	60.65	27.18	33.47	49.68	27.03	22.65	59.61	27.18	32.43
10	64.04	27.18	36.86	25.93	23.11	2.82	29.55	24.68	4.87
11	29.47	25.98	3.49	21.25	16.96	4.29	15.64	15.11	0.53
12	15.83	15.30	0.53	14.35	13.54	0.81	8.84	8.31	0.53

The powerhouse is located in the main stream of NmaihkaRiver. Chipwi Nge Hydropower Station draws water from ChipwiRiver as a tributary of NmaihkaRiver to main stream of NmaihkaRiver. Designed diversion flow is 26.46 m^3/s, accounting for only 1.2% of annual average flow of Nmaihka River at the powerhouse. It has little impact on hydrological regime of NmaihkaRiver waterways above the powerhouse.

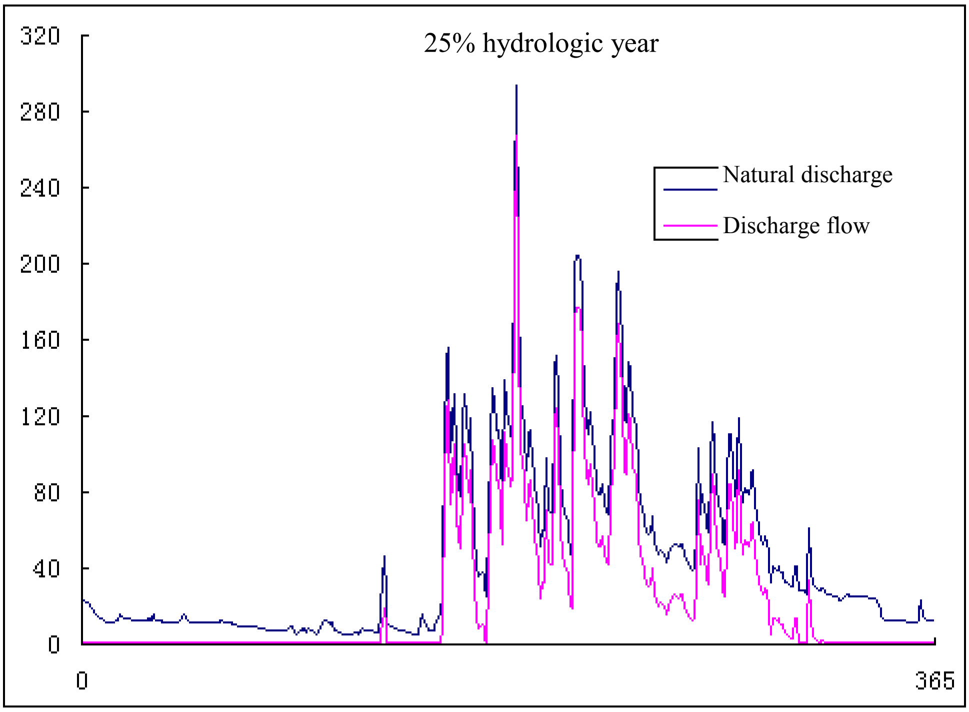


Figure 6-1 Day-by-day Comparison of Downstream Natural Flow and Discharged Flow in High Flow Year (P = 25%)

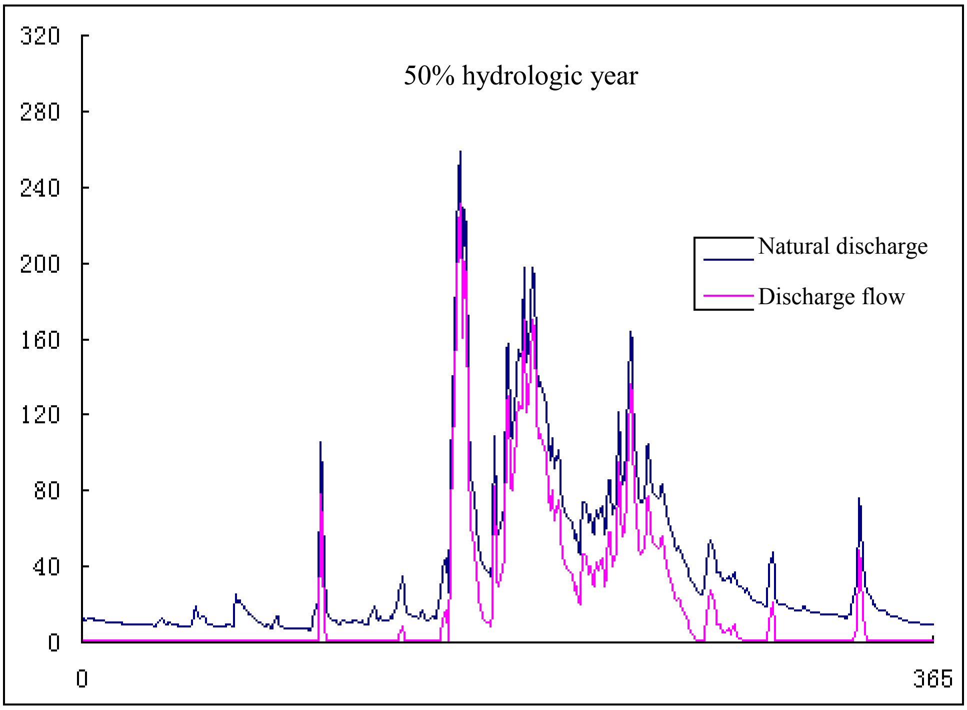


Figure 6-2 Day-by-day Comparison of Downstream Natural Flow and Discharged Flow in Normal Year (P = 50%)

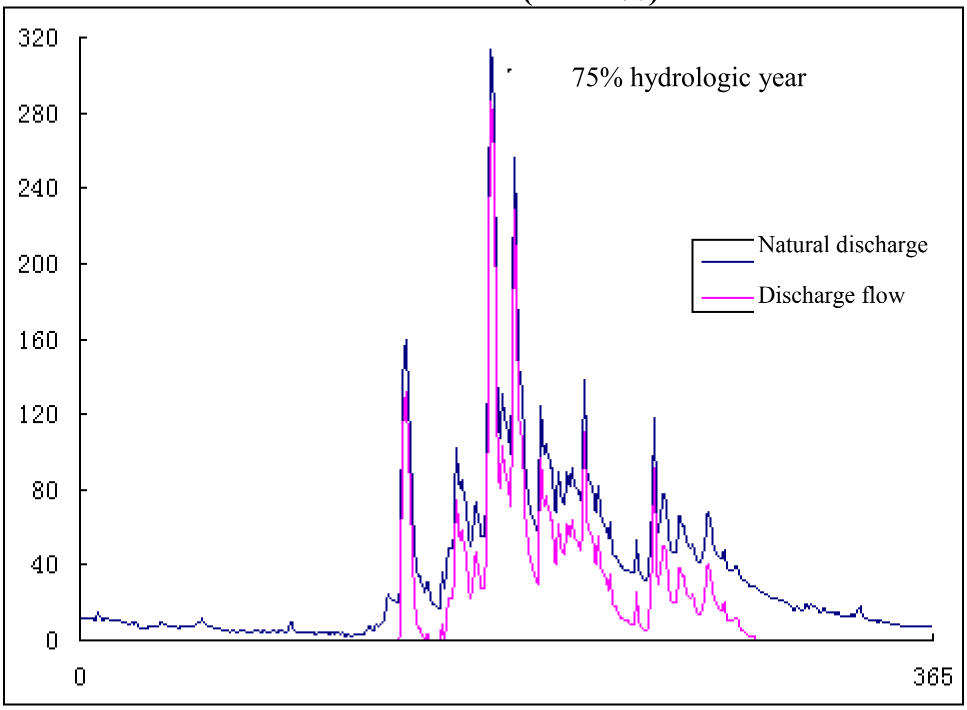


Figure 6-3 Day-by-day Comparison of Downstream Natural Flow and Discharged Flow in Low Flow Year (P = 75%)

6.2 Water environment

6.2.1Influence on water quality

(1) Construction period

In accordance with analysis on engineering characteristics of Chipwi Nge Hydropower

Station, influences of the project construction on water quality are mainly caused by discharge of construction wastewater and domestic sewage.

Influences on water quality of Chipwi River during the construction mainly include alkaline wastewater generated from concrete mixing, rinsing and curing, oily wastewater generated from construction machinery maintenance, foundation pit drainage, domestic sewage of construction personnel and so on. In the project, aggregate processing system adopts dry process and production process of three-stage crushing and three-stage screening to eliminate rinsing wastewater.

Concrete mixing stations are arranged respectively in a position about 300m in the downstream of the dam site on the right side, on the flat land in the upstream of powerhouse on the left bank and at No.1 to No.5 construction adits of diversion tunnel. Total amount of concrete pouring is 78,000 m^3. Concrete curing and rinsing wastewater reaches suspended solids concentration of about 5000mg / L and pH value of about 11. For similar water conservancy and hydropower projects, curing of $1m^3$ concrete generates about $0.35m^3$ alkaline wastewater. It can be estimated accordingly that total alkaline wastewater is 62,300 m^3 and rinsing wastewater per shift of concrete drum and tank is about $6m^3$. If alkaline wastewater is discharge randomly, it will cause destruction of the surrounding soil environment and affect water quality in the construction section.

The project is mechanized construction-based. Construction machineries draw power from fuels. About 140 construction machineries need to be rinsed regularly. The rinsing will generate a certain amount of oily wastewater. Based on average rinsing water of $0.6m^3$ per machinery, all machineries will consume about $84.0m^3$ of water once. Wastewater from machinery vehicle repair and rinsing water discharge has a high content of suspended matters and oil, including suspended matters of 500 to 1000mg/l and oil of about 10 ~ 30mg / l. If oily wastewater is discharged into water randomly, an oil film will cover the water to reduce dissolved oxygen reoxygenation rate and affect water quality in the construction section.

Cofferdam will be built to generate a foundation pit when hydraulic structure for Chipwi Nge Hydropower Station is built. Cofferdam seepage, rain and construction water are often discharged from the foundation pit. In accordance with monitoring data of other water conservancy and hydropower projects, common water of foundation pit is subject to suspended matter concentration of about 2000mg / L and pH value of 11 to 12. If foundation pit wastewater is directly discharged without treatment, it will affect water quality in the construction section.

There will be 860 persons at the peak of project construction and expected domestic sewage discharge is $99.6m^3$/d. COD, BOD5, SS and total nitrogen are more in the construction and domestic water. If domestic wastewater is directly discharged without treatment, it will affect water quality in the construction section.

Due to small project construction scale, the wastewater output is less. In addition, pollutant composition is simple. The wastewater will not cause adverse influences on water quality of ChipwiRiver after appropriate measures are taken and the influence will be temporary. The influence will disappear immediately after the construction comes to an end.

(2) Operation period

No industrial and domestic pollution is in the reservoir of Chipwi Nge Hydropower Station, so there will be almost no wastewater to enter the reservoir.

In the initial stage of impoundment for Chipwi Nge Hydropower Station, dissolution of nutrients in submerged lands may increase content of nitrogen and phosphorus in the water so as to facilitate enrichment of nitrogen, phosphorus and other nutrient elements. Chipwi Nge

Hydropower Station is a daily regulation one with frequent water exchange. It is expected that the impoundment will have little impact on eutrophication of water in the reservoir.

After the power plant is completed, it will reach normal pool level of 740m and backwater length of about 0.75km, the water level will be higher than that before dam construction to widen the water surface. Water volume in the backwater area will increase to enhance diluting effects, thus improving overall water quality in the reservoir. Reduction of discharged flow in the section from the dam site and estuary will affect dilution and self-purification capacity of the water.

In summary, constriction and operation of Chipwi Nge Hydropower Station will not affect significantly water quality in the river.

6.2.2Influence on water temperature

Chipwi Nge Hydropower Station has a daily regulation function and runoff reservoir capacity method is used for calculation to show a>20, indicating the reservoir is a mixed one. Water temperature in the reservoir will not be layered. Project construction and operation have no effect on reservoir water temperature.

6.3 Aquatic organisms

ChipwiRiver for Chipwi Nge Hydropower Station is a fast-flowing mountain stream with average hydraulic slope of 5% to 6%. Schizothorax, pareuchiloglanis, glyptothorax and pseudecheneis of fishes suitable for rapid stream habitats are likely to inhabit in ChipwiRiver.

After the reservoir filling, flow of river reach in the reservoir will decline so that water environment will be favorable to growth and breeding of aquatic organisms suitable for slow flow habitats. Fishes of Nmaihka river system are mainly the species suitable for rapids habitat. They will migrate to the upstream or rapids environment of NmaihkaRiver. Chipwi Nge Hydropower Station is subject to low-dam diversion development with a reservoir backwater length of about 0.75km. The project construction has little impact on schizothorax, pareuchiloglani, glyptothorax and pseudecheneis adaptive to rapids habitat.

After the power plant is completed, water flow of about 15.7km long river reach from the downstream to the powerhouse will decline sharply to reduce plankton and benthos. Fish resources in the river reach also will reduce. Fishes in the river reach are widely distributed in the NmaihkaRiver basin. The power plant construction only reduces their scope of habitats and the reduction is very small. Reduction of water flow in the water reduction river reach has a limited influence on fishes.

Dam construction will divide the complete river ecology system into two parts, the upstream and the downstream, to cause fragmentation of river habitat which will affect exchange between aquatic organisms. Fishes in the ChipwiRiver are widely distributed in the river system of NmaihkaRiver. In addition, reservoir for Chipwi Nge Hydropower Station has a backwater river reach of 0.75km long and downstream water reduction reach of about 15.7km. influencing reach is shorter, so the project construction will almost not play a significant impact on fish resources in the river system of NmaihkaRiver.

6.4 Terrestrial organisms

6.4.1Terrestrial plants

(1) Ecological integrity

The power plant is subject to diversion power generation. Its permanent land and reservoir inundation cover an area of 17.3hm^2, including only 12.2hm^2 for damage or inundation. The

influence on local vegetation is small and that on regional ecology system productivity is acceptable. Temporary construction land occupation will reduce vegetation area to lower biological productivity in the appraisal area, but the change is very small. In addition, vegetation restoration measures will be taken after the completion of construction, which can improve biological productivity. Project construction and operation will almost not change general heterogenization of vegetation patches and the influence on restoration stability and impedance stability of ecological systems in the project area will be very small.

(2) Terrestrial ecosystems

Due to reservoir inundation of Chipwi Nge Hydropower Station as well as construction of dam, powerhouse, construction road, diversion tunnel and construction adit, 12.2hm^2 of surface vegetation will be damaged, including 0.5hm^2 of orchard, 6.5hm^2 of economic forest, 0.7hm^2 of timber forest, 2.7hm^2 of grass land and 1.2hm^2 of shrub forest.

Pivotal project construction, construction site layout, stockyard excavation, slag yard field filling and other construction activities will directly damage original surface vegetation. Existing vegetation in the construction area will be completely changed to manmade structures. Plants in the project constriction area are seriously affected by human activities, mainly including vegetation of secondary forests and plants such as local common arbors, shrubs and weeds. Construction activities will not cause disappearance of species and substantial drop of the quantity. For the vegetation in the project area, damaged area will take a small proportion and the influence is at a lower level.

With gradual completion of all works, implementation of soil and water conservation, greening and landscaping measures as well as rapid vegetation growth and strong restoration under high summer temperature and rainfall in the construction area, all damaged vegetations except permanent buildings will be gradually restored. Productivity of terrestrial plants in the construction area will be restored manually to original level.

6.4.2 Terrestrial animals

Reservoir for Chipwi Nge Hydropower Station is small and its area will increase by only 0.08km^2 after filling. It will almost not affect reptiles and mammals inhabiting around the reservoir.

Due to disturbance of human activities, there is a small number of wild animals in the project area, which are mainly small ones such as snakes, rodents and birds. Direct influence of the project construction on reptiles, birds and animals is that focused activities and construction of construction personnel will drive these animals to leave the construction site and take secondary forests and shrubs as the habitats. There are habitats for small animals to habitat or migrate in the edge of the construction area. Therefore, the direct influence on these wild animals will be slight.

Disturbance to living environment of animals and even hunting in the project construction will reduce animals. But main animals in the construction area are frogs, common lizards, small birds and small mammals and have a small number. For the reason, activities of construction personnel will have little influence on wild animals in the area. But wildlife purchasing of construction personnel or management personnel will increase wildlife trading in the project area. It can improve intensity and frequency of hunters for hunting so as to reduce wild animals in the project area.

6.5 Soil erosion

New soil erosion may be caused by foundation excavation of dam, powerhouse, diversion tunnel and stockyard, construction road building, leveling of construction enterprises and

office & living site and slag.

In accordance with soil erosion status in the project area and engineering design data, construction of Chipwi Nge Hydropower Station will disturb 61.74hm^2 of surface and produce 65,100 m^3 of slag. Analysis and prediction show that the project construction may cause total soil erosion of about 16262t, including new amount of about 9241t.

Slope excavation for construction of dam, powerhouse and other buildings will change original landform and damage original surface vegetation so as to cause surface exposure, change original water movement form and reduce erosion resistance of surface soils. Steep slopes generated by excavation will reduce stability of natural slopes. If they are not reasonably protected, gravity erosion will be caused to affect safety of main engineering facilities. In addition to adverse impact on the project construction, the soil erosion also will increase channel sediments.

If no effective protection measure is timely taken during excavation of stockyard, large soil erosion hazards will be caused to affect ecological environment in the occupied range and surrounding area.

Construction enterprise site leveling and construction road building are subject to a large work amount, which will damage a large area of vegetation and increase soil erosion. If no effective protection measure is taken, land productivity and ecological environment in local sections will be affected to some extent.

Therefore, effective soil and water conservation measures shall be taken during the construction to prevent soil erosion in the construction area.

6.6 Acoustic environment

Noises in the construction area are caused mainly by excavation, drilling, blasting, concrete mixing, transportation and other activities. There are more excavation machineries to generate continuous noises at the level of 85dB to 115dB. Blasting will generate instantaneous noises at 130dB to 140dB. Concrete pouring will generate continuous noises at 90dB to 110dB. Aggregate processing will generate continuous noises of above 80dB. Processing and repair of auxiliary enterprises will generate intermittent noises at 80dB to 110dB, but they are concentrated in the processing and repair plant. Vehicle transport will generate traffic noises with line source at the level of 70dB to 90dB. In terms of project location, the construction area is located in an open valley which is sparsely populated. Construction personnel will be affected, so necessary protection measures shall be taken.

6.7 Atmospheric environment

There is no large atmospheric pollution source such as factories and mines near Chipwi Nge Hydropower Station, so the construction area have fresh air and good air quality.

Main air pollution sources during the construction period include fuel machinery exhaust, dusts caused by earthrock excavation, blasting, concrete mixing and aggregate crushing and screening as well as road dusts caused by vehicle transport. Main pollutants include TSP, SO2, etc.. The above construction activities will affect ambient air quality in local area, but the influence is temporary. It will disappear immediately after the construction is completed. In addition, the above construction activities will affect site construction personnel, so necessary protection measures must be taken for them.

6.8 Solid waste

Sold wastes generated during the construction of Chipwi Nge Hydropower Station include

waste slag and domestic garbage of construction personnel. Total slag of 665,100 m^3 will be generated in the construction. 830 construction personnel will be involved at the peak of construction for Chipwi Nge Hydropower Station. Based on the construction period of 29 months, garbage of 1kg /person/ day and specific gravity of 0.8t/m^3, all construction personnel will generate about 653m^3 of domestic garbage during the construction.

If no measure is taken, soil erosion will be caused in case of storms so as to affect water quality of AyeyawadyRiver and surrounding ecological environment. More construction personnel will be involved at the peak of construction. If domestic garbage is stacked randomly, it will pollute air, affect the appearance and breed mosquitoes and a lot of rodents under some conditions to increase transmission of diseases in the construction area. Therefore, sold wastes generated in the construction shall be properly handled.

6.9 Environmental geology

The reservoir is subject to small length, simple geological conditions and lack of fault. The reservoir basin is located in weakly permeable granitic gneiss rocks, so the reservoir is sealed properly without leakage; rocky slopes are distributed on both side of the reservoir to prevent immersion.

There are gullies on both sides of the dam site, including two gullies on the right side and eight small gullies on the left side. Surface of Slopes on both sides of ChipwiRiver and its gullies consists of soil layer and completely and highly weathered layer. It is prone to downward collapse, slip and solifluction under rain effects. Its coverage towards gullies and ChipwiRiver will easily cause mudslides. The mudslides will affect reservoir sedimentation and dam safety. Mudslide gullies about 100m in the upstream of water inlet are on the diagonally opposite of No.2 dangerous rockmass. The gullies affect No.2 dangerous rockmass and water inlet.

The No.2 dangerous rock mass is located on the left bank, with a distance of 155m to the upper dam axis. With a distribution elevation of 728m～764m, the rock mass is approximately 55m long, 15m wide and 15m～30m high. It is estimated that the volume is 8000m^3. The rock mass is made of diorite-granite gneiss. The No.2 dangerous rock mass is formed due to influences of three groups of fissures. At present, the rock mass is in stable state, but most of it will be submerged in water after reservoir impoundment.

Water inlet slope is nearly vertical to gneissosity direction. The excavation will generate a slope of about 50m high. There are more slope fractures and they are weathered to different extent, so the decompression is serious. The upper loose layer is thick locally and poor locally in the stability. Exits and entrances of tunnels, groove section and fault zone are subject to impact of surface decomposition and structure. Rocks are fractured and poorly stable.

Powerhouse excavation will generate artificial slopes of 12m to 50.5m high. They will be mainly distributed in the upstream, rear and downstream of the powerhouse. The upper slope is loose layer of 11.6m to 18.9m thick and it is prone to sliding after excavation. The lower rock slope has four groups of fractures most of which are opened and some are filled with a small amount of silty clay and gravel in poor properties. Fracture combination divides the slope into blocks by cutting. The slope will be subject to stability problem after excavation.

7 Social Impact Assessment (SIA)

7.1 Socialeconomy

Chipwi Nge Hydropower Station is designed to provide installed capacity of 99MW and annual average power generation of 609 million kW • h. Its original development task is to provide construction power for development of Myitsone and Chipwi hydropower stations in AyeyawadyRiver. Due to change of external conditions, the development task is adjusted to power supply for ChipwiTown and MyitkyinaCity. Social and economic impacts of Chipwi Nge Hydropower Station construction are as follows:

(1) To increase tax revenue and promote the comprehensive development of economy and society

Construction of Chipwi Nge Hydropower Station will bring new opportunities for regional economy development to inject fresh momentum into local financial income. New financial income sources are closely related to power generation and associated business of the power plant to promote comprehensive development of local economy. Under new financial supports, infrastructures in the area will have new investment opportunities such as road improvement, health care facility increase, education investment increase and cultural construction investment increase, which can directly enhance sustainable development capacity of local economy. Increase in local tax revenue will help solve fund lack in local economic and social development projects to promote coordination of regional economic and social development.

(2) To promote development of local related industries

Construction of Chipwi Nge Hydropower Station will certainly drive development of local related industries. Huge consumption of building materials for power plant construction can promote development of building materials production and processing in surrounding areas, drive development of logistics and increase trades in surrounding areas. A large number of living materials for power plant construction can promote production and trading of local agricultural and sideline products. After the power plant is completed, sufficient power supply will promote coordinated development of electric power related industries to provide energy guarantee for development of new industrialization.

(3) To increase employment opportunities for labor force

830 construction personnel will be involved at the peak of construction for Chipwi Nge Hydropower Station. The construction unit will actively encourage and absorb local residents to participate in engineering construction and provide services for construction, thus increasing revenues and improving living standard. First, a number of construction personnel will be hired locally; second, a huge number of construction personnel need corresponding logistics supports, which will promote development of local planting, breeding, logistics and other industries to create more employment opportunities for local labors; moreover, the power plant will need long-term operation and maintenance after completion, so more operation and management personnel will be hired locally. Thus it can be seen that power plant construction will bring a rare opportunity to local residents for poverty alleviation.

In summary, construction of Chipwi Nge Hydropower Station will inject fresh growth momentum into local financial revenue. Investment of project development funds can bring a number of employment opportunities to help local residents for poverty alleviation, promote development of building materials, transportation, services and other industries to change the

status of simple industrial structure and weak industrial foundation, provide reliable energy guarantee for economic development of Kachin State and become the driving force for comprehensive economic revitalization and development to change economic and social backwardness in Kachin State. In a word, construction of Chipwi Nge Hydropower Station will actively promote economic and social development of the basin and even KachinState.

7.2 Religious and ethnic culture

(1) Impact on religion

Construction of Chipwi Nge Hydropower Station doesn't involve local religious facilities. The construction will promote further development of economy and society in the area, progress of educational and health services, timely dissemination of scientific and technical knowledge via film, radio, television and network and protection for people's lives, which will change ideas of local residents.

(2) Impact on ethnic structure and culture

Construction of Chipwi Nge Hydropower Station doesn't involve migration, so it will not affect geographical space composite structure of minority cultures. But external cultures may affect local minority cultures to some extent. The construction will involve the larger ethnic groups such as Kachin, Burman and Shan with a long history of culture. External culture impact on these minorities is limited.

(3) Impact on ethnic relations

Construction of Chipwi Nge Hydropower Station can positively affect local ethnic relations. Local residents mainly include Kachin and other minorities under slow economic development. The project construction will help promote local economic development and social progress, improve production and living standards of local residents and enhance further solidarity and cooperation between peoples; help solve difficulties and problems in the development of local ethnic relations.

7.3 Indigenous people

World Bank's Indigenous People(OP / BP 4.10) is designed to achieve the mission of poverty alleviation and sustainable development by ensuring project development completely complies with dignity, rights, economy and culture of minorities.

Features and culture of indigenous people have been closely related to their lands and natural resources on which they depend for survival. Construction of Chipwi Nge Hydropower Station may bring different risks and influences to the minorities, including loss of national identity, culture and traditional livelihoods as well as disease intrusion. As a social group significantly different from social mainstream groups, the indigenous people (minorities) are generally the most marginalized and vulnerable group. Their economic, social and legal status usually limit the ability to protect interests and rights of their own lands, territories and other productive resources or participate in development projects to obtain benefits.

The indigenous people (minorities) play a vital role in the sustainable development. The international community has increased attention to protect their rights and interests. Therefore, construction of Chipwi Nge Hydropower Station shall pay widespread concern and attention to adverse impact on indigenous people, fully respect dignity, rights, economy and culture of local minorities and take feasible measures to protect interests of the indigenous people to achieve poverty alleviation and sustainable development.

7.4 Women and other vulnerable groups

Due to civil war in the construction area, economic situation is more severe. To increase family incomes, women have to bear more economic pressure and go out to work. But women have a lower employment rate than men. It is very difficult to go out looking for work.

Construction of Chipwi Nge Hydropower Station can provide more employment opportunities for local residents, especially women, poor people and other vulnerable groups. Demand of construction personnel and technical personnel for food and living goods will promote development of local tertiary industry to provide employment opportunities for women and other vulnerable groups under life stress, thus improving employment; in addition, it will increase financial revenues of government so that more funds will be invested into construction of health and education to positively improve culture level and health of women and other vulnerable groups.

7.5 Land use

The reservoir will have a water area of 9.7hm^2 and submerged land area of 8.1hm^2, including 0.1hm^2 of orchard, 2.5hm^2 of economic forest, 0.6hm^2 of timber forest, 1.6hm^2 of grass land, 0.1hm^2 of shrub forest and 3.2hm^2 of other lands. Dam site construction will permanently occupy a land area of 4.8hm^2, including 0.6hm^2 of paddy field, 0.4hm^2 of orchard, 1.9hm^2 of economic forest, 0.1hm^2 of timber forest, 0.4hm^2 of grass land, 1.1hm^2 of shrub forest and 0.3hm^2 of other lands.

With a small scale, Chipwi Nge Hydropower Station will have a small area for reservoir inundation and permanent land occupancy. Therefore, the impact on land use and agriculture production is very small.

7.6 Water resources utilization

7.6.1Impact on use of water resources

Water resources are rich in Myanmar. Ayeyawady, ChindwinRiver and SalweenRiver run through Myanmar from south to north. Total theoretical potential hydropower resources are about 70000MW and technical available hydroenergy resources are about 60000MW. Due to lack of funds, electricity market restriction and other reasons, utilization rate is only about 2%. Development of rich water resources in the upstream of AyeyawadyRiver can change resource advantage into economic advantage to promote social and economic development.

The upper reaches of Ayeyawady River are located in the northernmost of Kachin State in the north of Myanmar, where there is no national gird of Myanmar to cause serious lack of power supply so that government departments and some of the residents under the better economic conditions (mainly including self-employed persons of shops and hotels) install small diesel generators for power generation. Chipwi Nge Hydropower Station is designed to provide installed capacity of 99MW and annual average power generation of 609 million kW • h. The power plant can improve utilization of water resources in AyeyawadyRiver, supply sufficient power to ChipwiTown and MyitkyinaCity and promote development of water resources in AyeyawadyRiver.

7.6.2Impact on downstream water use

After Chipwi Nge Hydropower Station is completed, a water reduction reach of 15.7km long will occur between the dam site and estuary.

As shown from the investigation, the nearest two branch gullies are about 1.6km in the downstream of the dam, respectively with a catchment area of 10.0km^2 and 5.45km^2.

According to estimates, their annual average flows are respectively 0.73m^3 / s and 0.4m^3 / s. Plus discharged flow of 0.53m^3/s, average flow 1.6km in the downstream can reach 1.66m^3/s.

In accordance with site survey, scattered settlements are distributed on both sides of the reach from the dam to estuary. The settlements have a large height difference and distance from ChipwiRiver. Local residents take living water mainly from nearby streams or springs rather than ChipwiRiver. The water reduction reach has no requirements for irrigation and water supply.

In summary, Chipwi Nge Hydropower Station will not cause cutoff between the dam site and estuary or largely affect production and living water in the downstream after completion.

7.7 Infrastructure

(1) Transportation

The Myitsone reservoir area is connected with the external via waterways and highways. Due to large channel slope in the waterways, streams are fast-flowing so as to cause navigational hazards. Capsizing accidents often occur. There are two highways to connect the project area with the external, namely Myitkyina – Chipwi highway on the left bank of NmaihkaRiver and Injangyang-Chipwi highway on the right bank of NmaihkaRiver. Their roadbeds can reach the maximum width of 5 to 6m and minimum width of 3 to 4m. Both highways are extended along the mountain form and they are poorly linear. They have an uneven clay bound macadam pavement which becomes muddy in summer and often suffers slough to beak the traffic.

In the project area, villagers generally live near riverside highways or rivers and mostly are concentrated in natural villages subject to different sizes. Some villages are located along the above highways, some are connected with the above highways via branches to realize external transport and some have no highway.

Due to demand for materials transportation, the investor will upgrade roads in northern Myanmar and significantly improve transport facilities in the construction area to facilitate travel of local people and provide convenience to local investment and economic development.

There was no cement pavement in ChipwiCity and PangwaCity before construction of Chipwi Nge Hydropower Station. From 2009 to 2011, the project owner invested to build cement roads in ChipwiCity and PangwaCity, reconstruct bridges and road facilities to upgrade Myitsone - Myitkyina Highway and conduct repair or upgrade for multiple highways such as Myitsone - Laza, Myitkyina – Kambaiti and Panwa – Chipwi with a mileage of about 390km.

Therefore, construction of Chipwi Nge Hydropower Station and hydroelectric projects in the upper reaches of Ayeyawady will significantly improve traffic conditions for communication between the residents in the upper reaches and the external to promote economic exchanges and cultural exchanges between the reservoir residents and the external.





Upstream highways Upstream waterways





Before upgrading of roads in Chipwi City After upgrading of roads in ChipwiCity





Before upgrading of roads in Panwa City After upgrading of roads in PanwaCity

(2) Medical treatment and education

Some villages provide primary schools where kindergarten and grades of 1 to 4 are set up. Students need to learn in Myitkyina after graduation. A few villages are equipped with small hospitals. Many villages have no schools, hospitals and other medical, cultural and educational institutions. Medical and cultural education level is relatively low. Construction of Chipwi Nge Hydropower Station will promote economic and social development in Chipwi. Medical treatment, culture and education infrastructure in the project area also will be improved. Therefore, construction of Chipwi Nge Hydropower Station will be favorable to construction of infrastructures for medical treatment and cultural education.

7.8 Population health

In accordance with epidemic situation of infectious diseases in the construction area, main

infectious diseases are classified into insect-borne, food-borne and water-borne diseases, generally including malaria, cholera, dysentery, bfasciolopsis buski, fluke colon, hepatitis, typhoid and so on.

During the construction, construction personnel are dense. The construction area is sparsely populated with poor health conditions and humid subtropical environment, which provide conditions for breeding of mosquitoes and flies. If no attention is paid to food hygiene and sanitation for living areas, the possibility of infecting malaria, dengue fever, cholera and other diseases will be improved. Preventive quarantine shall be strengthened during the construction to prevent disease outbreaks.

7.9 Personnel training

International mature hydropower development and operational management experience will be introduced for construction of Chipwi Nge Hydropower Station, which will lay talent foundation for development of power industry development in Myanmar and improve the ability for independent construction, operation and management of power plant and grid. First, cooperation with local enterprises will train hydropower construction and management personnel for Myanmar. Second, local talents will be introduced for management and technical work during the operation of power plant after completion.

Relying on hydroelectric development in the upper reaches of AyeyawadyRiver, electric power talents will be trained for Myanmar in batches and stages. It is planned to train 60 personnel in the first stage and 20 hydropower operation and management personnel in the first batch have completed trainings. From September to December in 2011, three-month theoretical and practical trainings were conducted for 20 Myanmar personnel in China's universities with rich teacher resources and large hydro basin development companies with mature experience. In March 2013, 14 Myanmar employees sent by Myanmar Ministry of Electric Power completed theoretical and practical training for operation and maintenance before working for operation and maintenance of Chipwi Nge Hydropower Station. They have begun to work for operation and maintenance for the power plant.



The first batch of 20 Myanmar students receiving theoretical trainings in China



Myanmar staff training for operation and maintenance of Chipwi Nge Hydropower Station



Myanmar staff of Chipwi Nge Hydropower Station working after passing the trainings





On-site practical training

8Environmental risk assessment

8.1 Environmental risk identification

Environmental risks refer to hazards caused by emergent accidents to the environment (or health). Chipwi Nge Hydropower Station belongs to a medium Grade III hydropower project offering electric power to power stations of Myitsone and Chipwi. In project construction and operation, various development activities such as project construction and reservoir operation may directly or indirectly create new environmental risks or increase the existing environmental risks in the area and the surrounding areas. Engineering environmental risks are identified as Table 8.1-1. Identification results show: in the process of project construction, explosive magazine and oil depot may encounter explosion accidents due to emergent accidents, thus polluting the air and water environments, generating environmental risks, and possibly leading to water supply risks at the downstream construction area, belonging to new risks; in addition, reservoir filling may cause geological disaster risks; emergent pollution accidents of oil depot may generate the risk of water pollution, thus changing the habitats of aquatic animals. These risks are highly possible due to reservoir filling.

Table 8.1-1 Identification of Risk Factors Affecting the Environment of Chipwi Nge Hydropower Station

Engineering role	Risk source or direct factor	Risk type					
		Environmental geology	Water environment	Ecology	Air	Water supply	Pubic health
Engineering construction	Explosive magazine				√		√
	Oil depot		√	√	√	√	√
Reservoir filling	Water pressure	√					
	Pollution discharge		√	√		√	
	Habitat change			√			

8.2 Environmental risk analysis

Risk analysis of project construction is to probe into significant environmental accidents due to natural or artificial reasons in project construction or operation, thus leading to the maximum hazards to the environment, and also the corresponding measures adopted to tackle such risks.

8.2.1Accident risk analysis of oil depot and explosive magazine

According to the construction organization design of Chipwi Nge Hydropower Station, two oil depots and one explosive magazine shall be provided during the period of hub project construction.

(1) Oil depot accident risk analysis

Reasons for accidents of oil depots and filling stations are: ① Storage tank, pipe valve and pump break down due to poor maintenance, thus leading to oil/gas leakage and further fire and even explosion; ② fire and inflammation caused by static electricity and thunder; ③ operators of oil depots and filling stations make mistakes in work, thus leading to overflowing of crude oil, and further giving rise to fire and inflammation accidents when in contact with source of ignition.

According to the overall layout of project construction, the dam area and the plant area are

provided with an oil depot separately, located at the edge of the construction site.

Although oil depots and filling stations are far away from nearby residents and office camp, the explosion of oil depots could still have unfavorable impact on life and property safeties of the owner's personnel in the camp; the fire and inflammation of oil tanks may affect the environment at the downwind direction; crude oil leakage caused by oil tank explosion can have serious impact on the water quality at the downstream of Nmaihka River and underground water.

In terms of the construction of the existing hydropower projects, oil tanks and filling stations rarely encounter any accidents, and hydropower construction management is strict. Therefore, oil tanks and filling stations of the project stand the little possibility of explosion and leakage during the construction period, but it is still required to reinforce management and formulate the corresponding emergency measures and plans.

(2) Explosion magazine accident risk analysis

Reasons for explosion magazine accidents are: ① management personnel violate stipulations, smoking or creating the source of ignition, thus igniting explosive or triggering detonator; ② explosive explosion caused by electric spark due to static effect or thunder.

According to the construction organization design, the plant area is provided with an explosive magazine, which covers an area of 1,000m^2. The explosive magazine is far away from other construction sites, so its construction has little threat to construction personnel.

In explosive magazine design, safety measures include: various firefighting facilities; lightning-protection facilities and various static-proof facilities in the magazine; setting the safety protection distance of various structures in the magazine according to related design criteria; setting accident alarm system; formulating rigorous operating regulations. The explosive magazine is the key of safety and firefighting management in the whole project construction, and should be managed strictly and designed with precise measures against accidents. According to past hydropower project construction, the possibility of explosion is small. The explosive magazine is fenced with walls, and the vegetation in the scope is cleaned off, so fires caused by accidents may have little impact.





8.2.2 Reservoir-induced earthquake risk analysis

Chipwi Nge Hydropower Station is located at the Qinghai-Tibet reactive orogenic belt, and close to it include Chipwi fault extending along NmaihkaRiver and Chipwi-Tengchong east-west fault. Chipwi fault has been inactive for 1.18 million years, and there is no active

fault within 5km around the site. The construction site is located in the area with stable structure. Ground motion peak acceleration exceeding 10% probability in 50 years is 0.20g, and the corresponding seismic basic intensity is VIII.

The reservoir area is of simple geological conditions and undeveloped fault structure. Reservoir basins are located in granitic gneiss with weak water permeability, so the closure is excellent, and there is no leakage; the two banks of the reservoir are mainly rock slopes. Before water filling, there is no super-large, huge sliding mass, collapse aggregate and dangerous rock with poor stability in the dry reservoir. There are sparsely-distributed dangerous rocks at the head and some sections of the reservoir, which do not cause reservoir immersion.

To sum up, the reservoir area of Chipwi NgeHydropower Station are of good geological conditions, and the risk of reservoir-induced geological disaster is low.

8.3 Environmental risk prevention measures

8.3.1Measures against environmental risk of oil depots

(1) Formulate the rigorous oil depot safety management system, and standardize oil transportation, storage and use.

(2) Oil depots are provided with telephones connected with local firefighting department for immediate contact. There are special firefighting lines in oil depots, and the duty room of fire pump is equipped with a number of special answering telephones (at least one for oil depot and station separately). Divisions of oil depots are equipped with primary alarms, which can give an alarm in time in the case of fires. Oil depots are also provided with several explosion-proof wireless walkie-talkies for production and firefighting instruction. Oil tanks are surrounded by fire banks, and reinforced with waterproof material to control the vegetation on fire banks. Accident oil sumps are offered to collect leaking oil, and deliver it to special department for disposal. If penetrating through fire banks and fencing walls, pipes should be protected with sleeves and filled with inflammable material.

(3) Operators in oil depots should wear anti-static working clothes and conductive working shoes. Oil tanks are equipped with lightning-protection grounding measures; oil pipeline on the ground or in trenches should be equipped with lightning-protection and anti-static measures; oil delivery station, pump shed or house and other structures in distributed in oil depots should be designed with lightning-protection measures. Source of ignition in oil depots should be controlled strictly. Smoke and fire are forbidden in oil depots, and source of ignition likely to lead to fire should be checked periodically, such as wire; in oil loading and unloading and vehicle refueling, related personnel should make patrol inspection so as to eliminate smoking.

(4) Fire pump house is provided with fire pump and fixed low-expansion foam fire extinguishing system, a sub-grounded fire pool that can provide enough water for extinguishing one fire, and also a fire water collection pool to reduce oil-containing water‘s hazard to nearby water and soil. Collected fire water is transported to the outside for disposal.

(5) Oil depots should be provided with some oil spilling control emergency equipment and appliances, including explosion-proof oil pump and oil vessel, trench separator, special tools and equipment for emergent repair, and special instrument and equipment for detecting oil spilling.

8.3.2Explosive magazine environmental risk prevention measures

This environmental assessment has the following requirements on environmental risk

prevention measures:

(1) The stock of a single explosive magazine should meet requirements of criteria.

(2) Among warehouses are the corresponding earth embankment for protection so as to offer protective barrier for both two structures; explosive magazine is built with gate and fencing wall, and the distance between fencing wall and each warehouse is above 15m. Lookout posts are provided in explosive magazine; duty room is arranged at a suitable position 250m away from warehouse.

(3) Explosive magazine and detonator magazine are provided with outdoor fire hydrants, and fire pools are arranged on the slope outside the magazines. Its water pressure and quantity should meet requirements of criteria.

(4) There is no electric equipment in warehouses according to criteria; cables in warehouses are buried, and outside power lines are laid overhead.

(5) Independent lightning rod tower is adopted to protect warehouses against lightning stroke. All metal parts in warehouses should go through equipotential iterative earthing so as to prevent warehouses from generating static electricity.



8.4 Risk accident emergency plan

On the premise of adopting risk prevention measures, directed at emergent environmental risks (mainly pollution risk in the project), the project owner should set up the risk accident emergency headquarters with local government, scientific research institute, and project undertaker to uniformly implement the risk accident emergency plan so as to minimize hazards and environmental losses caused by risk accidents. The major duties and responsibilities of the risk accident emergency headquarters are: formulating environmental risk accident emergency plan, coordinating the implementation of risk emergency plan, releasing information to the public, and starting emergency monitoring, emergency procedure, and emergency plan drill. The following is the emergency plan for environmental risks of oil depots and explosive magazines:

(1) Emergency plan areas

Emergency plan areas include: ① oil tank area; ② explosive magazine area; ③ environmental protection goal area, mainly surrounding settlements and water areas; and ④ geological disaster-stricken areas.

Emergency events include fire, explosion, oil spilling, debris flow, landslide etc.

(2) Framework and personnel of emergency organization

1) Emergency leadership

Emergency chief leadership organization is the emergency public event emergency commission of the local government. As the coordinating command institution, it is responsible for the treatment of emergent public events.

2) Site command

The emergency leadership organization designates the site director. As for fire and explosion, fire chief usually assumes the post of site director, instructing the whole process of emergency reactions; the chief of safety section is responsible for instructing actions against oil spilling.

3) Emergent rescue personnel

Emergent rescue personnel is composed of: ① dangerous source control team; ② the wounded-rescue team; ③ medical aid team; ④ firefighting team; ⑤ safety evacuation team; ⑥ safety warning team; ⑦ material supply team; ⑧environment monitoring team; ⑨ expert consultation team; ⑩ comprehensive coordinating team; and ⑪ aftermath treatment team.

4) Alarm and communication ways

① Alarm way: set the special alarm telephone in the construction close-off management area, fire alarm in the construction area, and local fire reporting telephone.

② Emergent communications: emergent leadership organization contacts site directors through walkie talkie and telephones.

5) Emergency protection measures

Dangerous source control team and firefighting team should investigate accident scene and obtain evidence, make analysis on accident type, generation time, pollution source, major pollutants, and affecting scope, form preliminary opinions, and make feedback to site directors and emergency leadership organization.

Safety warning team should set warning sign in accident area, and prohibit irrelevant personnel from entering. All teams should coordinate with each other, control dangerous sources in time, cut off spreading means, and control fireproof and explosion-proof areas, dispose of pollution sources, and avoid the dispersal of pollution. Material supply team should offer various materials and equipment needed.

6) Plans for personnel evacuation and withdrawal

Trapped personnel in areas stricken by disasters are searched and rescued by the safety evacuation team; irrelevant personnel in the warning area are evacuated by the construction unit with the assistance of the safety evacuation team.

7) Close the emergency rescue and recovery measures

After the entire emergency response and rescue work is completed, that the scene of the incident under control, event condition has been eliminated and sources of leakage or release has been reduced to less than the prescribed limits. Approved by the leading group,the on-site command can announced the lifting of the state of emergency, and release information.

8) Emergency Training Program

In order to ensure the effectiveness and operability of contingency plans, Training Program must be pre-planned for personnel involved in training and equipment, equipment maintenance, so that each individual can do to participate in contingency operations master.

Conduct a regular emergency drills to found the weak link through exercises, and modify, improve emergency plans.

9) Public education and information

Publicity and education should be devoleped for the residents of the nearby area wherethe accidents might happen.Therelevant information should bereleasedin time.

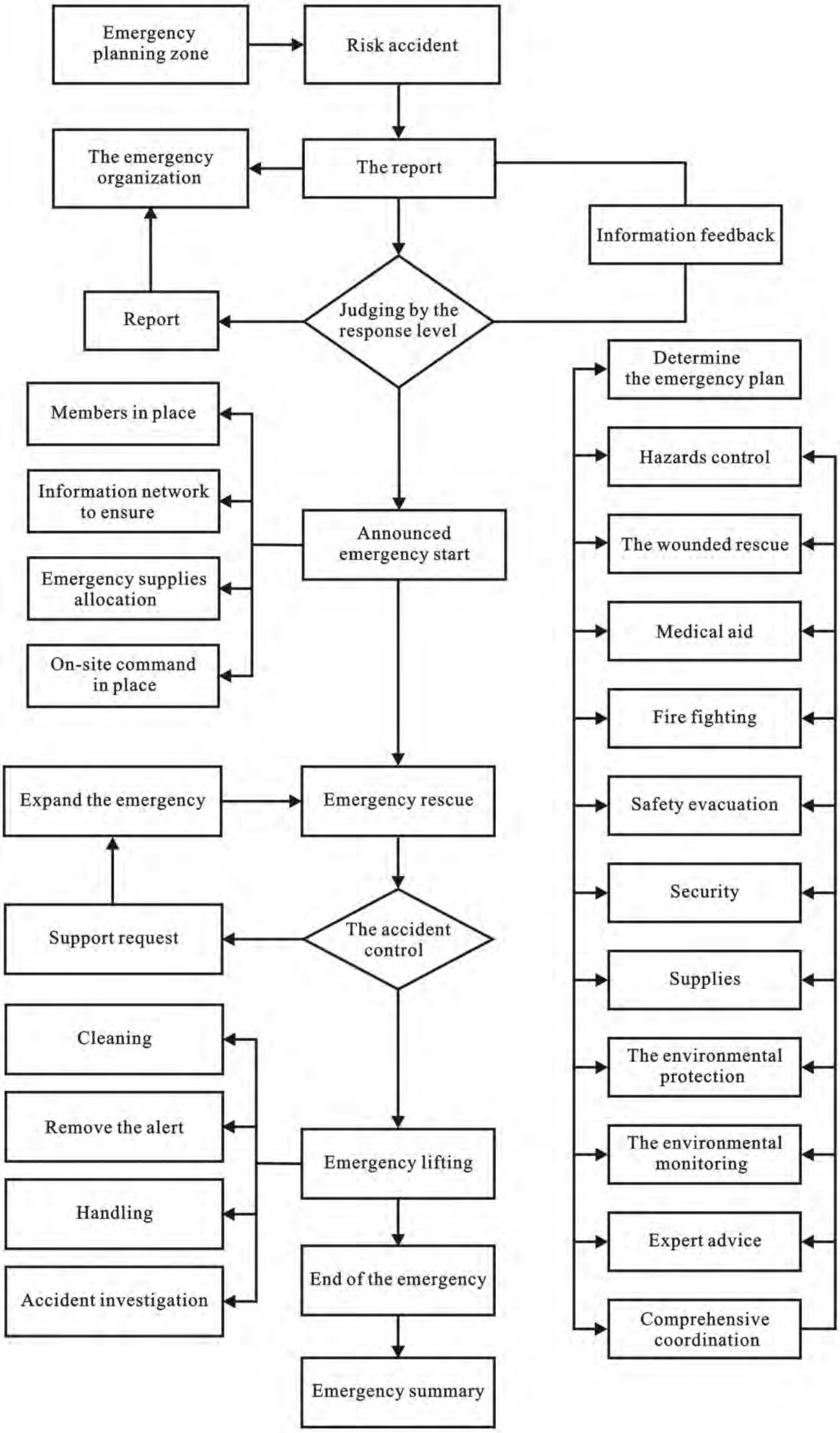


Chart 8.4-1 Emergency procedures

9Environmental impact economic benefit and loss analysis

The purpose of environmental impact economic benefit and loss analysis of hydropower development in the upper reaches of Ayeyawady River is to, based on principles of environmental economics, analyze environmental benefit and loss of hydropower development with the expense～benefit analysis method on the premise of the sustainable development of hydropower development and ecological environment, social environment and economy & society.

9.1Environmental economic benefit

9.1.1Economic benefit

9.1.1.1 Direct economic benefit

According to the *Feasibility Study Report of Chipwi Nge Hydropower Station*, the original task of Chipwi Nge Hydropower Station is to offer power to two hydropower stations of Myitsone and Chipwi. Due to changes of external conditions, Chipwi Nge Hydropower Station is designed to offer electricity to ChipwiTown and MyitkyinaCity after the consultation between the party of Myanmar and CPIYN

Installed capacity of Chipwi Nge Hydropower Station is 99MW, and annual power output 599 million kW·h. In normal cases, Myanmar can obtain gain on foreign exchange of RMB 2.4 billion Yuan, approximately about USD 400 million dollars, within the franchised period of Chipwi Nge Hydropower Station; after the end of the franchised period, assets of over RMB 1 billion Yuan will be delivered to the government of Myanmar for continuous operation free of charge.

9.1.1.2Driving economic growth

From the perspective of expenditure, consumption, investment and import & export are the major strengths driving the growth of national economy. Investment can boost consumption and lend an impetus to import & export trade through demand effect and supply effect. Demand effect of investment refers to the demand for production materials and labor commodities due to investment activities. For instance, the construction of hydropower station may create demands for building materials, equipment and laborers. Supply effect of investment refers to the fact that investment can inject new production factors into the social reproduction process, and further form new capital. The concrete manifestation is the increase of the supply of production materials (such as machine and plant). Therefore, investment can remarkably facilitate economic growth of a country or a region.

Our company establishes measurement model to analyze investment‘s facilitation to economic growth according to 152 countries/regions‘ (China‘s Hong Kong and Taiwan are listed separately) GDP and fixed asset investment data in above 10 years from 1960-2011 in Global Economic Prospects database. According to regression analysis results, the range of investment multiplier in the 152 countries/regions is [1.128，8.959]. The value of investment multiplier is related to factors such as the country/region‘s consumption inclination, investment efficiency and import/export status. Investment multipliers of most of countries in the world are ranged between 3 and 6.

Total investment in Chipwi Nge Hydropower Station hits RMB 1 billion Yuan, and is able to generate GDP of RMB 1.128 billion Yuan (calculated by investment multiplier 1.128) for Kachin State, or GDP of RMB 8.959 billion Yuan (calculated by investment multiplier 8.959) at most. If estimated in the light of the status of most countries in the world, Chipwi

NgeHydropower Station can generate GDP of RMB 3-6 billion for the drainage base of KachinState.

9.1.1.3 Promoting the adjustment and optimization of industrial structure

Kachin‘s industry is yet to be developed. Industrial structure is dominated by farm crops processing and handicraft industry, there are currently only some rice mills, saw mills, sugar mills and cigarette factories, etc., among which the pillar industry is the sugar mill located at NanmudiTown, and handloom industry is wide spread. There are only a few small power plants in Kachin State, with a gross electric generating capacity of about 3.04 million kW•h, and 15 towns and 15 villages have already been using electricity for lighting. The commerce of cities such as Myitkyina and Bhamo began to grow in recent years.

This shows that economic development of KachinState is still in the initial stage. According to the theory of regional economic development stage, Kachin State should actively accumulate capital, energetically develop modern industries, and optimize industrial structure so as to jump to the higher economic development stage. In the economic development planning brought forth by the government of Myanmar in 2011, the economic development goal has been shifted from “be based on agriculture and comprehensively develop the economy of other factors” into “further develop agriculture, establish a modern industrial country, and comprehensively develop the economy of other sectors.”The construction of Chipwi Nge Hydropower Station (construction power plant) will effectively facilitate the adjustment and optimization of industrial structure of KachinState.

9.1.1.4 Promoting the development of related industries

(1) The development of the electric power industry

Chipwi Nge Hydropower Station can guarantee power supply for the development of the heavy industry, modern industry and hi-tech industry of KachinState and Myanmar. Electric power output of Myanmar was 5.85 billion kw·h (World Date Bank：world Development Indicators &Global Development Finance Database) in 2010. According to the preliminary forecast, the maximum load of power demand will be about 3,634MW in 2020, and power demand about 17.8 billion kW·h. After put into operation, Chipwi Nge Hydropower Station can supply power of about 48 million kW·h to KachinState each year free of charge, thus greatly facilitating the industrial development of the region.

(2) Development of the building material industry

Building materials for hydropower project and supporting facilities can, in terms of source, fall into natural materials and artificial materials. Natural materials include soil, aggregate, and timber; artificial materials include limestone, cement, metal, geosynthetics, and high-molecular polymer. The construction of Chipwi Nge Hydropower Station requires supplying large quantities of building materials, and major material demands include 812,700m^3 earthwork, 178,000m^3 concrete and 42,000t reinforcement. During the construction period, it is also required to exploit natural building materials, and process artificial materials such as concrete and reinforcement. The huge demand will necessarily impel the development of the local building material industry.

(3) Development of the building industry

Since traffic conditions in the project area are poor, the construction of the hydropower station requires building or expanding special external traffic roads. For instance, Chipwi～Panwa road and Tengchong～Waxiao～Chipwi road, for the poor condition, have to be expanded according to the need of the project; meanwhile, roads in the construction area have to be built, including a river-crossing bridge and seven major construction roads. Therefore, the

construction of Chipwi Nge Hydropower Station has the large building demand, and can directly facilitate the development of the local building industry.

(4) Development of the transportation industry

The construction of Chipwi Nge Hydropower Station will call for a large amount of materials, including building material, food, and articles for daily use. Some materials can be purchased in KachinState directly and then transported to the construction site. Some materials have to be purchased from other regions of Myanmar. And some building materials such as cement and reinforcement have to be imported from South China, and transported to the construction area. Therefore, the project will have the large transportation demand.

(5) Development of the tourism industry

Three basic factors should be available for the development of the tourism industry: firstly, varied tourism resources for the attraction of tourists; secondly, convenient traffic for the travel of tourists; lastly, living service facilities for the enjoyment and rest of tourists.

The development degree in the project area is low. Natural and elegant scenery is the local treasonable landscape resource. Chipwi Nge Hydropower Station will effectively improve local waterway and road conditions, thus offering favorable conditions for the development of tourism resources in the project area. In addition, the construction of the hydropower station will greatly impel the development of the local economy, facilitate the construction of regional service infrastructures, and offer the strong support for local tourism development.

(6) Development of the life service industry

During the peak construction period, Chipwi Nge Hydropower Station will need about 830 laborers. Such a large number of laborers will have a considerable demand for clothes, food and recreation. Therefore, project construction will also promote the development of local living service industries like catering, accommodation and recreation besides tourism.

9.1.1.5Increasing fiscal revenue

The construction and operation of Chipwi Nge Hydropower Station will bring about considerable tax revenue for local public finance of KachinState.

In terms of direct effect, taxes related to the construction and operation of hydropower projects include corporate income tax, value-added tax, and operating tax. If equipment and building materials are imported, enterprises should also pay tariffs. In addition, according to tax policies of different countries, others taxes should also be paid, such as urban construction tax, education surcharge, and resource tax. For hydropower development in Myanmar, major taxes involved are income tax, business tax and tariff. Therefore, Myanmar can obtain big economic benefits in terms of income tax, business tax and tariff from the construction and operation ofChipwi Nge Hydropower Station.

Secondly, in terms of indirect effect, we can find out through analysis in the previous two sections that Chipwi Nge Hydropower Station will facilitate economic growth of the region, and also the development of related industries such as building material, tourism, service, and transportation. Furthermore, regional economic growth and the development of related industries can increase local and national fiscal revenues. Therefore, the project may have the remarkable indirect effect on the increase of fiscal revenues.

Meanwhile, the increase of Myanmar central fiscal revenue and Kachin local fiscal revenue can correspondingly lift expenditures in economic construction, which specifically covers agriculture& farming, fuel & energy, mining, manufacturing & building, traffic & communications. From 2003 to 2005, economic construction expenditure accounted for 32.88%, 30.54% and 34.33% of the central financial expenditure of Myanmar (International

Monetary Fund *Government Finance Statistics Yearbook 2008*). This means that about 1/3 of fiscal revenue from Chipwi Nge Hydropower Station will be used for economic construction, and economic construction will further lend an impetus to local economic development, thus forming the virtuous cycle.

9.1.2 Social benefit

9.1.2.1 Employment

The hydropower project‘s promotion to employment falls into direct impact and indirect impact. First of all, the development and construction of the project involves a number of value chains such as design, consultation, construction, equipment production, environmental service and finance, thus creating a large number of job opportunities. Data released by National Hydropower Association reveal that the United States‘ hydropower installed capacity is 100,000MW (including pumped storage), which creates 300,000 jobs. Installed capacity of each MW can generate 3 jobs on average. According to research results of Denmark Navigant, a famous consultation firm in the world, the United States still has 400,000MW hydropower development potential (including inland and offshore) presently. It is estimated that the hydropower industry of the United States will create 700,000 jobs in 2025.

During the peak construction period, Chipwi Nge Hydropower Station will need 830 workers. Estimated by data of the United States, total installed capacity of Chipwi Nge Hydropower Station is 99MW. From construction to operation, the project will produce 300 job opportunities.

According to the above analysis, the construction of Chipwi Nge Hydropower Station will lend an impetus to the development of industries like building material, building, transportation, tourism, living service and agriculture. The development of the industries can also create more jobs. Therefore, the project construction can promote local employment.

9.1.2.2 Living level

(1) Resident income

In 2010, Myanmar‘s national income per capita was 437,000Kyats, equivalent to USD 539 dollars. According to the latest income grouping standard released by the World Bank in 2008, Myanmar belongs to a low-income country since its national income per capita is lower than USD 975 dollars. The development of Chipwi Nge Hydropower Station will directly increase resident incomes of KachinState through increasing job opportunities, facilitating the development of related industries and boosting economic growth.

(2) Infrastructure facilities

New and expanded roads will be superior to original ones in terms of grade and quality; the new river-crossing bridge can connect roads at the two banks of ChipwiRiver. Therefore, Chipwi Nge Hydropower Station will remarkably improve local traffic facility conditions and offer convenience for the travel of local residents.

In addition, the construction of Chipwi Nge Hydropower Station will increase fiscal revenue of Kachin government. Compared with financial expenditures of Myanmar government (Table 9.1-1), about 20% of the increased fiscal revenue will be used for infrastructures, thus further improving infrastructure conditions of KachinState.

Table 9.1-1 Proportion of expenditures for improving residents' living to central finance of Myanmar from 2003 to 2005

Year	Education	Medical treatment	Social guarantee	Housing and community facilities	Traffic	Entertainment, culture and religion
2003	12.1%	3.2%	1.3%	1.3%	20.2%	0.7%
2004	13.3%	3.5%	1.3%	1.1%	17.2%	0.8%
2005	6.8%	2.1%	0.8%	0.6%	20.0%	0.4%

Data source: IMF, Government Finance Statistics Yearbook, 2008

(3) Education and medical treatment

The construction of Chipwi Nge Hydropower Station will increase fiscal revenue of Kachin government. Compared with financial expenditures of Myanmar government (Table 5.2-1), about 10% of the increased fiscal revenue will be used for education and medical treatment, thus further improving education and medical treatment conditions of Kachin State.

(4) Living way

In 2009, per capita household electricity consumption of Myanmar is 104kWh, far lower than the world‘s average level of 2803 kWh; in 2009, two out of 1,000 people in Myanmar use Internet while the world‘s average level is 300. In normal cases, after its completion, Chipwi Nge Hydropower Station can offer 48 million kW•h to Myanmar free of charge ever year, and is able to effectively lift local residents‘ incomes and facilitate power consumption of Kachin residents. Meanwhile, fiscal revenue from the project can further improve local power grid and communications network, conducive to local people shifting to modern living ways.

9.1.2.3 Technology diffusion

After 100 years of development, Chinese hydropower, through absorption, conversion and independent innovation, has possessed the world‘s many advanced technologies, healthy management system, and scientific operating concepts.

Through Sino-Myanmar cooperation, developing Chipwi Nge Hydropower Station can form the effective technology diffusion, cultivating hydropower design, construction and management talents for Myanmar, and gradually introducing environmental impact assessment system, owner system, supervision system, and bidding system into the country. Meanwhile, Myanmar can find out and track the latest hydropower operation and dispatching concept and practical experience, and this is of referential significance for hydropower development in other drainage basins of Myanmarin the future, and will also facilitate the sustainable development of hydropower in the whole Myanmar.

9.1.3Environmental benefit

Chipwi Nge Hydropower Station is a clean, renewable energy project. Compared with coal-fired plants, its environmental benefit during the operating period is mainly manifested in:

(1)Reducing the consumption of coal resources

Coal is the mixture formed mainly with various complicated macromolecule organic compounds and also inorganic mineral substances. Presently, modern chemical technologies are employed to extract 130 kinds of by-products and a variety of rare valuable elements, which are indispensable substances for people‘s life and economic construction. At present, coal resources are poorly utilized, and most of coal is burned off simply.

Due to the backward exploitation technology, ecological damage caused by the exploitation of coal resource is also a serious problem. Saving coal resource and slowing down the exploitation of coal resource is of great significance for the sustainable utilization of coal resource and the protection of ecological environment in the coal mine area.

Annual average power output of Chipwi Nge Hydropower Station is 599 million kW•h, so it is estimated that economic value of reduced coal resource consumption each year can reach RMB 268 million Yuan.

(2) Reducing the emission of greenhouse gases such as CO_2

Taking thermal power as the alternative scheme will generate a great amount of greenhouse gases such as CO_2, thus leading to greenhouse effect. Serious greenhouse will give rise to grave results such as sea level rise, climate disaster, land drought, desertization area increase, pest and disease damage increase, and change of ecological system.

If thermal power combustion coal for the production of 1KWH generates 0.997kgCO_2, the implementation of Chipwi Nge Hydropower Station can reduce CO_2 emission by 607,200 tons each year. If the price for carbon emission per ton is RMB 100 Yuan, annual economic value of the reduced carbon emission from Chipwi Nge Hydropower Station is estimated to be RMB 60.72 million Yuan.

(3) Other benefits

SO_2 emission is one of the important reasons for the mounting acid rain harm. Acid rain pollution will lead to remarkable economic loss to ecological environment and buildings. SO_2 emitted from coal-fired power plants in the form of elevated sources is the major reason for acid rain. According to estimation, replacing thermal power with hydropower can reduce SO_2 emission by 18,400 tons and NO_2 emission by 9,000 tons. Therefore, the project can effectively slow down the increase of SO_2 and NO_2 emissions due to the increasingly higher demand for electric power, and further relieve acid rain harm caused. Due to the shortage of local energy and short supply of electric power, residents continuously chop down forests to maintain their lives. After the operation of Chipwi Nge Hydropower Station, residents can use electricity rather than woods in their daily living, thus greatly reducing the area of forest chopping and protecting forest vegetation.

According to the above analysis results, Chipwi Nge Hydropower Station‘s overall environmental benefit of taking thermal power as the alternative scheme is about RMB 329 million Yuan (excluding some environmental benefit that can not be monetized.)

9.2Loss on environmental impact

Environmental protection of Chipwi Nge Hydropower Station will cost RMB 20.8445 million Yuan, covering water and soil conservation, water environment protection, terrestrial organism protection, aquatic organism protection, atmospheric environment protection, acoustic environment protection, domestic rubbish disposal, people‘s health protection, and environmental monitoring.

To sum up, environmental economic loss of Chipwi Nge Hydropower Station is about RMB 20.8445 million Yuan.

9.3Cost-benefit analysis on environmental impact

Cost-benefit analysis method will be used to analyze the environmental economic cost and benefit. The economic benefit ofChipwi Nge Hydropower Station (construction power plant) is significant, with notable social benefits and environmental benefit of reducing CO2 emission. The cost for environmental impact loss and for measures to avoid potential economic loss, to recover and compensate adverse environmental impact is smaller.Chipwi Nge Hydropower Station (construction power plant) can generate significant economic benefit, and its social benefit and environmental benefit are much larger than environmental impact loss.

10 Public participation

10.1 Characteristics of Chipwi Nge Hydropower Station

Chipwi Nge Hydropower Station (construction power plant) is a diversion type hydropower station, the main hub consists of dam, diversion system, diversion buildings and powerhouse. The dam and power station intakes are located on ChipwiRiver, the dam is a concrete gravity dam, with dam intakes, and the diversion line is in a form of folded line. The tunnel has an internal diameter of 4.0m. The powerhouse and tailrace is located at the left bank of NmaihkaRiver, the powerhouse is a open plant which axis forms an angle of 30 ° with the axis of the penstock. Chipwi Nge Hydropower Station has a normal water level of 740m, the total length of backwater: 0.75km, regulating capacity is 281,000 m^3, with a daily regulation capacity. The power station has an installed capacity of 99MW, a guaranteed output of 25.9MW (P = 90%), and an annual average generating capacity of 599 million kW • h.

The project covers both permanent and temporary areas. The permanent area includes two parts, namely reservoir inundation and construction occupation, covering a total area of 17.3 hm^2, of which reservoir inundation covers an area of 9.7 hm^2, and construction occupation covers an area of 7.6 hm^2 (construction occupation at dam site covers an area of 4.8 hm^2; and construction occupation at powerhouse covers an area of 2.8 hm^2). The temporary areas are covered by construction accesses, production and living, excavation site, spoil yard and other associated facilities, covering a total area of 56.39 hm^2.

As it involves only a small amount of garden plot and woodland within the scope, and no any residences are involved, resettlement will not be necessary.

10.2 Public participation

Various forms of public participation are involved in planning, design, engineering and construction of Chipwi Nge Hydropower Station, mainly including four forms as following:

(1) Forum

In order to make the local governments of Myanmar and local people fully understand the planning, design, engineering and construction of Chipwi Nge Hydropower Station, the assessors and other relevant parties have organized forums to the public for many times, introducing the situations of the project, including the basic characteristics of the project, the potential adverse effects and the favorable effects of the construction, as well as strategies and measures to be taken.

(2) Technical seminar

CPIYN and CDC have held meetings and seminars for many times during the planning, design, engineering and construction of Chipwi Nge Hydropower Station, organizing relevant experts, environmental assessors and social assessors to discuss the environmental and social issues related to the construction of Chipwi Nge Hydropower Station.

(3) Communication and exchange during compensations for land coverings

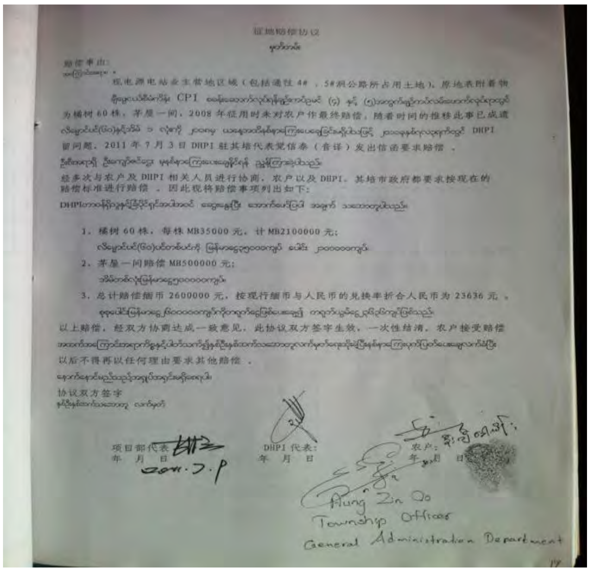
The scope of Chipwi Nge Hydropower Station only involves a small amount of garden plots and woodlands, and no any residences are involved, so resettlement will not be necessary. In the process of physical compensations, the designers and assessors fully respect the opinions of local people and actively satisfy their needs to avoid damages to their interests.











征地赔偿协议

赔偿事由:

坝电源电站业主营地区域（包括通往 4#，5#洞公路所占用土地），原地表附着物为橡树 60 株，茅屋一间，2008 年征用时未对农户作最终赔偿，随着时间的推移此事已成遗留问题，2011 年 7 月 3 日 DHPI 驻其培代表觉信泰（音译）发出信函要求赔偿。

经多次与农户及 DHPI 相关人员进行协商，农户以及 DHPI，其培市政府都要求按现在的赔偿标准进行赔偿。因此现将赔偿事项列出如下:

1、橡树 60 株，每株 MB35000 元，计 MB2100000 元;

2、茅屋一间赔偿 MB500000 元;

3、总计赔偿缅币 2600000 元，按现行缅币与人民币的兑换率折合人民币为 23636 元。

以上赔偿，经双方协商达成一致意见，此协议双方签字生效，一次性结清，农户接受赔偿以后不得再以任何理由要求其他赔偿。

协议双方签字

项目部代表:　　　　DHPI 代表:　　　　农户:
年　月　日　　　　年　月　日　　　　年　月　日

2011.7.9

Aung Zin Oo
Township Officer
General Administration Department



(4) Others

We actively participate in all activities organized by local governments and public organizations during the planning, design, engineering and construction of Chipwi Nge Hydropower Station, and take effective measures to award the local communities, so that positive results are obtained.









10.3 Conclusion

The designers, assessors and contractors have adopted a variety of public participation approaches during the planning, design, engineering and construction of Chipwi Nge Hydropower Station, to fully respect the interests and needs of local people and fully listen, feedback, solve and implement the aspirations of local people. In addition, through extensive publicity and communication, we get more understanding and supports for development and construction of Chipwi Nge Hydropower Station.

11 Environmental management plan (EMP)

11.1 Mitigation measures and implementation for environmental impacts

11.1.1 Mitigation measures for environmental impacts

11.1.1.1 Water environment protection measures

(1) Alkaline wastewater

According to construction management plan, two concrete mixing plants, of which each is built up respectively in the dam site and the plant construction site. Concrete mixing system wastewater comes from flushing operations of concrete mixing drums and material bins, featured as high content of suspended solids up to 5000 mg/L, the pH value is around 11, and the flushing wastewater is about 6m^3 from each shift.

Alkaline wastewater treatment processes: two alkaline wastewater treatment ponds, operating interchangeably, will be located respectively at two concrete mixing systems, and the flushing wastewater will be drained to the ponds after the works of one shift for settlement till the closing of the next shift, and the settlement time shall not be less than 6 hours, and sulfuric acid will be dosed to neutralize, then discharge or reuse after found qualified. The process is as shown in Figure 11.1-1.

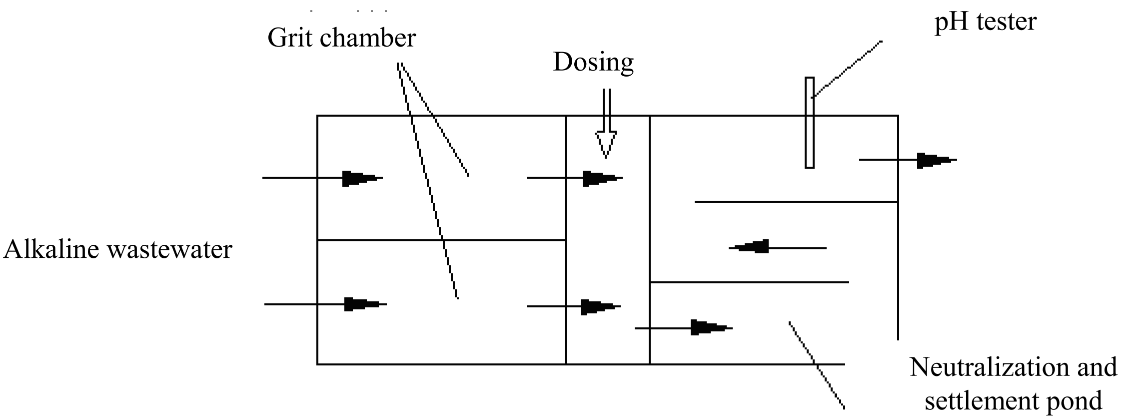


Figure 11.1-1 Flow diagram of alkaline wastewater treatment processes

Design parameters: design wastewater treatment flow 6 m^3/time

The main structural size: the ditch has a rectangular cross-section, with a size of 0.2m × 0.2m (width × height); and the size of grease trap is 4.0m × 1.8m × 1.2m (length × width × height).

Workload estimates: the major workloads of alkaline wastewater treatment ponds are estimated as Table 11.1-1.

Table 11.1-1 Estimates of major workloads of alkaline wastewater treatment ponds Unit: m^3

Item	Excavation	Filling	Concrete
Single grit chamber	21.1	9.5	4.4
Total of four grit chambers	84.4	38.0	17.6

2) Oily wastewater

There are two machine parking lots in this project, one is located at the right bank, upstream

of the dam site where is about 150m away from the dam site, and another one is located at the flat area of left bank, upstream of the powerhouse, and each of the parking lot can generate oily wastewater from flushing operations up to 42.0m^3/d.

Oily wastewater treatment processes: a simple wastewater collection system will be installed at the machine parking lot, and the oily wastewater will be collected through the ditch and treated with the grease trap prior to discharging or reusing after found qualified. The process in the grit grease trap is as shown in Figure 11.1-2.

Design parameters: the total flushing duration is assumed as 3 hours, then the design wastewater treatment flow is 14.0m^3/h, wastewater residence time is 10min, flow rate ≤ 6mm/s and sludge discharge cycle is 7 days.

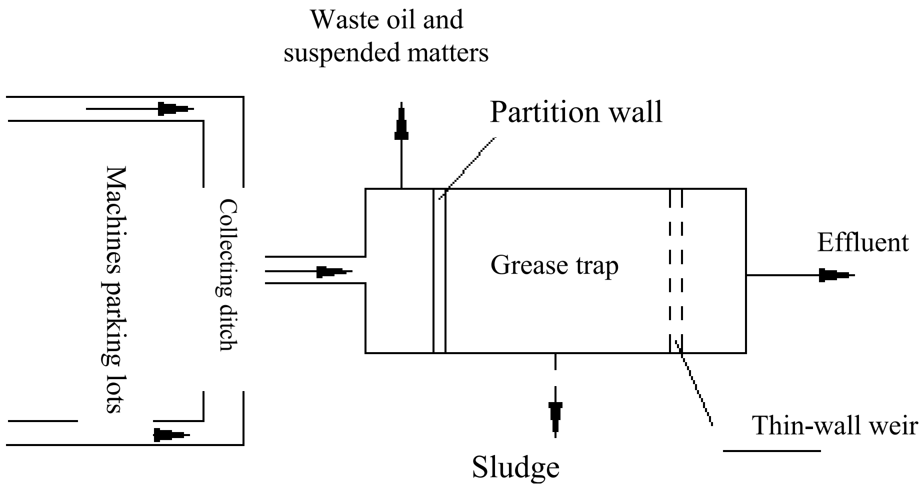


Figure 11.1-2 Diagram of process of oily wastewater treatment

The main structural size: the ditch has a rectangular cross-section, with a size of 0.2m × 0.2m (width × height); and the size of grease trap is 3.3m×0.7m×1.2m (length × width × height).

Workload estimates: the major workloads of alkaline wastewater treatment ponds are estimated as Table 11.1-1.

Table 11.1-2 Estimates of major workloads of oily wastewater treatment ponds Unit: m^3

Item	Excavation	Filling	Concrete
Single grease trap	11.5	6.8	2.5
Total of two grease traps	23.6	13.8	5.2

3) Domestic sewage

There are two construction camps at the project, one is located at the right bank, downstream of the dam site where is about 300m away from the dam site, and another one is located at the flat area of left bank, upstream of the powerhouse, with 480 and 350 construction workers respectively.

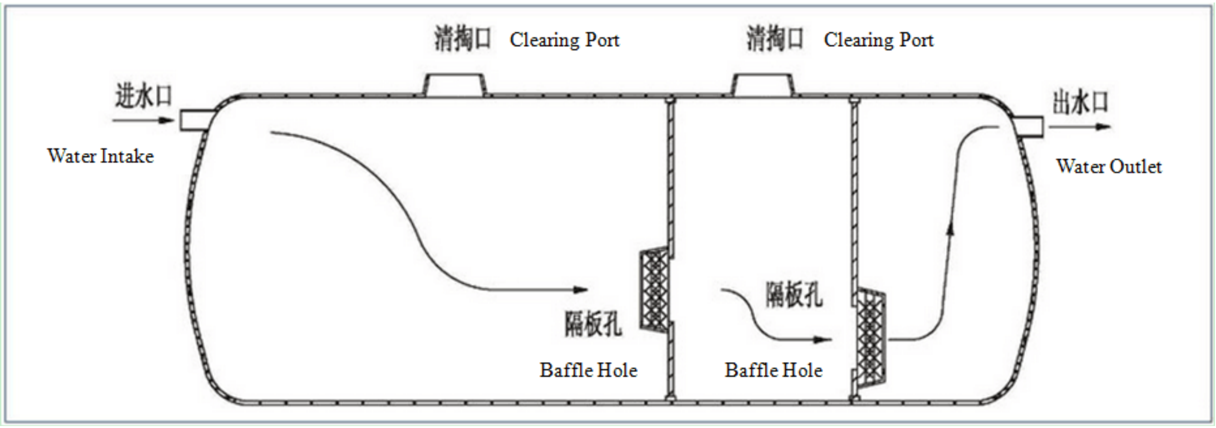
Septic tanks will be used as the planning, and the design sewage quantity is 150 L/person • day, with a cleaning cycle of 90 days. The design excludes the considerations of traffic or ground water, the tank cover overburden depth is 0.7m, and if the overburden depth is greater than 0.7m, then the tank body will be reinforced. One septic tank consists of three divisions, and the wall is made of cement, mortar and bricks, the bottom is made of 15mm thick C25 concrete on 10cm thick gravel bedding course. The precast concrete structures are made of C25 reinforced concrete, and the protective cover is 10mm thick for reinforcement. The precast concrete components shall be made of C25 reinforced concrete, and the protective

cover is 10mm thick for reinforcement. The backfilling shall not be carried out until the tank cover is in place.

The plant construction camp can be used as owner's camp in closing stages. The domestic sewage treatment facilities initially used for construction periods can be used to treat the domestic sewage generated by the workers of the power plant. The treated sewage can be reused, such as used for greening purposes in the plant or living areas.

Table 11.1-3 Parameters of septic tank at the construction site

NO. of construction camp	Design headcount	Actual headcount	Effective volume m^3
Dam site	480	196	6
Plant	350	140	4



11.1.1.2 Ecological and environmental protection measures

(1) Protection objectives

Protect the integrity of regional ecosystems; protect the vegetation at the construction area; restore the vegetation due to damages caused by reservoir inundation and construction activities as much as possible, so that the vegetation coverage area can be maintained or better; protect the wildlife habitats and avoid interferences caused by construction activities; maintain the aquatic biodiversity in the reservoir and downstream river sections, and protect the fish resources from being damaged due to construction activities; prevent and control the additional soil erosion due to construction activities; make a rational use of water and land resources; improve the land productivity; and protect the ecological environment.

(2) Ecological environment protection measures

1) Ecological protection and prevention measures

Focus on advocacy, education and personnel training works. By taking a series of measures to promote education and training, to raise the public awareness to terrestrial organisms, especially to the various functions and benefits of terrestrial organisms, so that strengthen the public awareness of the significance of protection of the terrestrial organisms and transitions of concepts to establish a good atmosphere conducive to the protection.

Raise awareness of construction workers to protection, and it is prohibited to hunt wild animals. Education and training will be carried out for the workers prior to construction activities, to inform them that it is prohibited to hunt wild animals and it is necessary to

protect them as far as possible if we encounter them during construction activities; the construction workers are prohibited to buy wild animals from local hunters; eliminate consumptions of wild animals and their products or other activities impacting on local wild animals.

Try to work beyond the margins of secondary ecosystems or habitats, and minimize the disturbances and destructions to the ground surfaces and vegetation in order to maintain the integrity of the natural ecosystems at the construction area. The hub construction, especially the road construction shall be carried out with deep excavation or high filling avoided, so as to minimize the construction disturbances and mitigate damages to natural ecosystems and vegetation.

Install animal protection warning signs in the construction area, and there are 10 signs will be installed, including two signs respectively at the dam site and the plant, one sign respectively at six adits. The construction workers are prohibited to hunt in the mountains or forests, and they are also prohibited to hunt frogs, snakes, birds or other wild animals; if wild animals and their habitats are discovered during construction activities, then evasive actions shall be taken.

Make a reasonable arrangement for the operation time of construction machines to try to avoid disturbances to the animals; and the highly noisy construction activities, such as blasting, shall be avoided in the breeding seasons of animals.

Reduce the impacts caused by construction on local vegetation to a minimum degree, while strengthen public education and fire prevention measures and establish construction area fire prevention and fire alarm systems to prevent and avoid the damages caused by fire to the vegetation.

2) Restoration and compensation measures for ecological impacts

In addition to land and water conservation measures, the on-site restoration, greening and landscaping will be carried out as ecological environment construction. The vegetation surrounding the main structures, construction camps, spoil yards, excavation sites and two sides of the roads shall be restored, to maintain the vegetation coverage against construction activities and ensure the original ecological functions of the area.

Specific to the impacts on the ecological environment caused by the water reduction river section as long as 15.7km from the dam to the river mouth, a discharging ecological flow of $0.53m^3/s$ has been taken into account in the design. The discharging opening of the ecological flow is located at the $^{\#}5$ dam section where is close to the right side of the sluicing and sand discharging opening, it is in a horizontal arrangement, with an internal diameter D = 20cm and a center elevation= 720.0m, the centerline is 1.5m away from the right side wall of the sluicing and sand discharging opening. The outlet is located at the downstream opening of the right side wall of the sluicing and sand discharging opening, maintenance butterfly valves and working butterfly valves are located near the outlets, the discharging flow can be adjusted according to the changes in the upstream heads, and the discharged water flows directly into the river bed through the outlets.

Specific to the flooded plants, the methods including transplanting for saplings and nursing for big trees will be adopted, to move them to the positions above the reservoir inundation line where close to their original habitats for protection .

Further investigate the terrestrial organisms on a regular and irregular basis, and pay attentions to and master the changes in populations of rare and endangered species and their adaptive behaviors after the hydropower developments. Carry out appropriate monitoring of dynamics of populations and species according to the habitat characteristics and distributions of mammals, birds, amphibians and reptiles.

11.1.1.3 Water and land conservation measures

According to the layout, functions, construction technologies and construction features of Chipwi Nge Hydropower Station, five water and land conservation zones are determined: prevention and treatment zone for main structures; prevention and treatment zone for roads; prevention and treatment zone for construction, production and living activities; prevention and treatment zone for excavation site; and prevention and treatment zone for spoil yard.

(1) Prevention and treatment zone for main structures

The main structures include reservoir inundation area, dam, water lines and powerhouse.

The length of the reservoir inundation zone is short in this project, and the river valley is 60m ~ 90m wide. The two banks are featured as steep, with a slope ≥ 35°. No landslides are found in the surface investigation, and the mountains at two sides are basically in a steady state, showing heaps of collapsed stone. Most will be flooded after impoundment of the reservoir, and the impacts are fewer on the reservoir. After the completion of this project, no additional prevention and control measures are needed for the reservoir banks.

In the dam construction process, greatest water and soil erosion occurs at the excavation processes of earthworks and rockworks, and some serious impacts will be caused on the water and soil erosion at the project site during formation of new slopes due to excavation of dam shoulders. It is difficult to configure new slope protective measures due to limitations of dam construction site, so relevant cautions and requirements will be proposed to the excavation processes, and it is required that the workers shall strengthen construction safety and standardized operation to prevent serious water and soil erosion caused by operational factors; after completion of the project, in order to protect the safety of the project, new slope protection measures, featured as good water and soil conservation effects, will be designed for the main structures. Therefore it is not necessary to configure new water and soil conservation measures after the completion of the project.

Except for open-cut operations for the diversion tunnel faces, the remaining shall be excavated in a concealed manner. During excavation of tunnel faces and tunnel bodies, appropriate support and drainage measures are taken into account in the construction management plan, to guarantee the safety of the project while brings good water and soil conservation effects. Therefore it is not necessary to configure new water and soil conservation measures for the diversion tunnels.

Powerhouse is located at a slope in left bank of Nmaihka River where 9km away from Chipwi City, the plant drainage issues have been taken into account in the main structural design, and there are drainage ditches available around the plant; new slopes are formed due to hillside excavation behind the plant, and some measures are taken into account for the main structures to ensure the project safety, the slope cutting is carried out from top to bottom according to different slope ratio according to different rock conditions, and concrete shot protection is adopted for the slope surfaces, and a 2m wide berm is available every 15m height difference vertically to ensure the stability of the slopes formed with excavation.

On the basis of body construction design, greening will be carried out on the platforms formed after construction of dams as the soil and water conservation design, and the greening area is about 0.5 hm^2 as the preliminary estimates, with white clover planted, the sowing density is 50kg/hm^2 and the sowing amount is 25kg.

(2) Prevention and treatment zone for roads

According to the distribution of the construction roads, the construction roads include accesses to the river, dam, cofferdam, foundation pit and all adits, covering a total length of 29.1km.

Most of construction roads are built up on the slope, with 50% excavation and 50% filling. The water and soil conservation measures include: excavate to form ditches and arrange appropriate slope protection measures at the side to be excavated; protect the road slopes at the side to be filled; and build up masonry retaining wall at the toe of the filling side.

The ditches are masonry works in a rectangular cross-section, with a bottom width of 0.3m, a depth of 0.3m and a masonry thickness of 0.3m. The ditch is 29.1km long, with a soil excavation quantity of 15714 m^3 and a masonry quantity of 13095 m^3. The filled road slopes will be protected with turfs and sowed with white clover, of which the sowing density is 50 kg/hm^2, sowing area is about 14.55 hm^2 and sowing quantity is 727.5kg. The filled slope toes are protected with masonry retaining walls in trapezoidal cross-sections, with a top width of 0.5m and an average height of 1.0m above the ground, the slope ratio is 1:0.2, depth is 0.5m, construction length is 29.1km, and the masonry quantity is 33465 m^3.

(3) Prevention and treatment zone for construction, production and living activities

The construction, production and living area contains living facilities and production facilities, covering a total area of 2.9hm^2. The living facilities include construction camp and office housing; and production facilities include concrete mixing system, a variety of materials processing facilities, material warehouses, material excavation sites and machines parking and maintenance spaces.

In the construction period, temporary drainage ditches will be formed by mean of excavation within the site, with a density of 300m/hm^2 and in a trapezoidal cross-section, the bottom width is 0.3m, depth is 0.3m and slope ratio is 1:1. The length of the drainage ditch is about 870m and excavation quantity is 156.6m^3. After the completion of the project, the construction, production and living area shall be leveled which involves a total area of 2.9hm^2. The vegetation will be recovered after site leveling, it is planned to plant 7250 camphor, with white clover sowed under the trees in a density of 50kg/hm^2, and the sowing quantity is 145kg.

(4) Prevention and treatment zone for excavation site

The excavation sites include soil excavation site, rock excavation site and gravel excavation site.

1) Soil excavation site

Soil excavation site is located at right bank of the ChipwiRiver and upstream of the dam site, and it consists of secondary terraces and residual slopes, covering a total area of 2.1hm^2.

Soil and water conservation measures at the soil excavation site: topsoil stripping protection, on-site drainage, and on-site restoration measures after the completion of the project.

According to the results of the geological survey, the soil excavation site is covered with 0.5m thick dark gray silty clay, consisting of a lot of plant roots and can not meet the construction needs. Therefore it is useless and shall be removed, and the topsoil clearing quantity is about 10,500 m^3. It is planned to store the topsoil at the corners of the excavation site after clearance, and then used as the backfilling soil covering for the excavation site after the completion of the project. The average stacking height is assumed as 2m, and the topsoil stockpiling area is 0.525hm^2. After the removal of the topsoil, a slope shall be formed with a ratio of 1:2 around it, and the surface and slopes shall be sowed with grass seeds for temporary protection. The grass will be white clover according to the natural conditions of the project site, with a sowing density of 50kg/hm^2 and a sowing quantity of 28kg.

During excavation of soil, temporary soil ditches will be formed around the operation position by means of excavation, and it is in a trapezoidal cross-section, with a bottom width of 0.3m,

a depth of 0.3m, and a slope ratio of 1:1. The excavation length is about 365m and excavation quantity is 65.7m^3.

After the project is completed, the excavation site will be leveled and the topsoil stripped will be backfilled as the covering.

2) Rock excavation site

The rock excavation site for dam site is located at the right bank of ChipwiRiver, and it is a hill body at north of the highway about 1km away from the downstream of the dam site. The terrain is steep, with a slope of about 50° ~ 70°, and vegetation is covering some surfaces. There are collapsed rocks distributed as thick as 1m to 3m along the highway. The outcropping rock shows black, grey, white and medium coarse-grained hornblende granite gneiss, featured as fresh and covering an area of 0.6 hm^2.

The rock excavation site for plant site is located at 800m away from the left bank, upstream of Nmaihka River, the south boundary is the ditch of debris flow, and a gully passes under the rock excavation site. The rock excavation site mainly consists of slope north to the debris flow, and the slope top elevation is about 500m, with the surface mainly covered by vegetation, and the mixture of clay and rock as thick as 5m can be found formed by debris flow near the bottom of the gully. The gully bottom elevation is about 245m, outcropping rock as long as 200m can be found along the gully bottom, the rock is hornblende granite gneiss featured as fresh, the mineable thickness is great and covering an area of 0.25 hm^2.

At the rock excavation site, the water and soil conservation measures include: stripping topsoil protection; drainage measures around the site; excavation platform restoration after completion; and vertical protective measures for the excavation surface.

The topsoil stripping quantity is about 4300 m^3at the rock excavation site, and the soil is temporarily stored at the spoil yard (then will be returned to the rock excavation site as the covering). The average stacking height is 2m, with a stacking area of 0.21hm^2 and sowed with white clover as the protection. A slope of 1:2 is formed around it. The sowing density is 50kg/hm^2 and sowing quantity is 10.5kg.

After the excavation of rocks, it is necessary to form intercepting ditches and drainage ditches on the top and at two sides. The ditches shall be made of masonry works, in a rectangular cross-section, 0.3m wide and 0.3m deep, and the masonry thickness is 0.3m. The total length of the ditches will be 908m, with an earthwork and rockwork excavation quantity of 490 m^3 and a masonry quantity of 409 m^3. After the excavation operations, the site will be leveled, including leveling the excavation platform and vertical protection measures for the excavation surface. The excavation platform will be re-covered by the topsoil stripped, with azaleas planted, covering an area of about 0.6hm^2, the spacing between two lines will be 2m × 2m, and 1500 seedlings will be planted. White clover will be sowed in a density of 50kg/hm^2, and the sowing quantity is 38.64kg.

During the rock excavation operations, a berm will be formed every 10m ~ 15m, and it is planned to build up vertical protective measures on the berms after the excavation operations. Precast reinforced concrete grids will be located in an interval of 3m for containing nutrient soil, in a size of 0.5m × 0.5 m × 0.6m (length × width × height), and 150 grids will be available for planting ivy, of which each grid contains three seedlings.

3) Sand and gravel excavation site

The sand and gravel excavation site is located at the junction of mouth of ChipwiRiver and left bank of NmaihkaRiver. The length of excavation site is about 250m along ChipwiRiver, bordering a low pebble floodplain and distributed along NmaihkaRiver for about 200m.

The excavation site is flat and about 10m higher than NmaihkaRiver, mostly containing medium-fine sand with low clay content, the mineable thickness is about 6m, and pebble as thick as 4m is under it. The sand and gravel excavation site covers an area of about 3.08hm^2.

The sand and gravel excavation site is located at the floodplain. It is necessary to remove the useless layers during the excavation operations, and the useful layers will be excavated and conveyed with excavators. The water and soil conservation measures for the sand and gravel excavation site mainly include protection of useless layers and restoration of the site after excavation operations. The total volume of useless layers to be removed will be about 15,000 m^3, and stacked at the corners and then used as site restoration after the completion of the project. Woven bags will be used as the retaining measures for useless layers. The useless layers contain large particles which can not meet the basic needs of plant growth, so plant protection measures will not be available on them. The useless layer stacking area is about 0.75hm^2, and the retaining measures show a trapezoidal cross-section, with a top width of 0.5m, a height of 1m and a slope ratio of 1:1. The retaining length is 450m and the masonry quantity is 675m^3 needed by the retaining measures.

(5) Spoil yard

The water and soil conservation measures include retaining measures, drainage measures, and protective measures at the tops and slopes of the debris after dumping operations.

Before the beginning of the dumping operations, masonry retaining walls will be built up around the spoil yard, and masonry ditches in a rectangular cross-section will be built up beyond the retaining walls. The dumping debris contain large particles which can not meet the basic needs of plant growth, so after the dumping operations, it is only necessary to level and compact the debris, and form a slope of 1:3, without any planting measures in place.

11.1.1.4 Population health protection

(1) Protection objectives

Protect the health of construction workers; strengthen the formation of the health and epidemic prevention system in the stage of construction; prevent the breeding of vectors related to impoundment and construction activities; ensure that the incidence of infectious diseases is not higher than the current level.

(2) Protection measures

1) Environmental health management

Kill leeches, mosquitoes, rats and flies on a monthly basis in the living area in order to reduce the vectors of infectious diseases. Before the arrival of construction workers in the construction worker camps, carry out a cleaning campaign at where densely populated at the construction worker camps and construction sites while remove weeds, garbage and solid wastes. Strengthen the environmental health management at the places including drinking water sources, public catering locations, spoil yards and public toilets in the construction stage. Carry out health inspections on a regular basis. In addition to daily cleaning, overall cleaning will be carried out at least once per month, and the living garbage shall be collected with garbage bins, and then sorted for treatments.

2) Health and epidemic prevention

Construction workers must undergo quarantine prior to arrival, and the patients must be treated in isolation to cut off the transmissions upon the discovery of new infectious diseases. The malaria prevention drugs such as quinine will be distributed to the workers who are found healthy after the quarantine. According to the construction schedule arrangements, one sampling inspection will be carried out respectively prior to commencement, at peak

construction periods and prior to project completion, and the headcount involved in the inspection shall account for 1/3 of total headcount of workers at the peak construction periods. The diseases involved in quarantine include dengue fever, malaria, cholera, hepatitis and other infectious diseases, and these diseases must be treated in a timely manner upon found. Provide preventive medication, vaccination and other preventive measures on a regular basis to the construction workers. Pay attentions to mosquito extermination works at the construction area to prevent the occurrence of dengue fever, and if symptoms of dengue fever are found, treatments shall be in place as soon as possible.

Strengthen supervision and management of food hygiene; pay attentions to drinking water safety for construction workers; and disinfect the living water on a regular basis.

The persons shall be identified responsible for health and epidemic prevention, and epidemic reporting systems and emergency measures shall be established in all construction departments. Medicines and equipment shall be readily available for treatment of common infectious diseases, and if an outbreak is detected, the measures such as treatment, isolation and observation shall be taken specific to the infectious sources, and preventive and protective measures shall be adopted for the vulnerable populations.

3) Public health facilities

Full-time health personnel will be appointed to take responsibilities of the general treatments of diseases and accidents; carry out inspection of epidemic prevention on a regular basis; and publicize and introduce relevant health and epidemic prevention knowledge to the construction workers.

Strengthen supervision and management of food hygiene, and pay attentions to drinking water safety for construction workers.

Improve the hygiene conditions at the construction area; do a good job at treatment of domestic wastes and human & livestock manure at the construction area; build up toilets and place trash bins at the construction worker camp and densely populated positions.

A public toilet, with a building area of $50m^2$, will be available respectively at the dam site and the construction worker camp. There are five partitions in each toilet, of which four for men‘s toilet and one for women‘s toilet, the spacing between two partitions is 0.9m and the height of each partition is 1.0m. Appropriate tap flush system shall be available in each toilet. The roof height is 3.5m. Good ventilation and lighting will be maintained and night lighting measures shall be available. The floor shall be hardened and easy to clean. The septic tanks shall meet the standards. The temporary toilets shall be removed and disinfected after the completion of the project. The septic tanks can be used continuously to treat the domestic sewage from the power station during its operation.

Trash bins will be available in the construction and living area to collect domestic wastes. A trash bin will be corresponding to 120kg waste, so there will be a total of 9 trash bins at the dam site and construction worker camp.

4) Labor protection for construction workers

Provide dust prevention supplies, such as dust masks to the workers who work in highly dusty environment according to relevant national labor protection laws.

Clarify the labor protection provisions related to noise prevention in the bidding contract, and the contractor shall provide anti-noise earplugs, anti-noise earmuffs, anti-noise helmets and other protective equipment to the construction workers who are under great noise impacts.

The concrete mixer operators, bulldozer drivers, excavator drivers and factory workers shall work in shifts.

5) Security protection of construction workers

According to the introductions provided by local residents and on-site personnel, python, wild boar and other wild animals often appear in the shrubs and grass which may cause threats to the physical safety of the construction workers, so it is necessary to provide publicity and education related to security to the construction workers, and relevant provisions shall be available at the ecological protection warning signs to draw attentions of construction workers to their personal security.

11.1.1.5 Atmospheric environmental protection

(1) Dust reduction and control for excavation and blasting

The bidding contract shall stipulate that the contractors must use the construction machines and transport tools with good emission working conditions. Wet operations are preferred for chiseling, drilling and blasting, and the construction machines with dust collection devices shall be used to reduce the amount of dust generated by construction. During open-air blasting, straw bags shall be used to cover the blasting surface to reduce dust generated by blasting.

Provide dust prevention supplies, such as dust masks to the workers who work in highly dusty environment according to relevant national labor protection laws.

(2) Dust reduction and control for aggregate system and concrete system

Improve the performance monitoring of the dust reduction effects of the concrete mixing system, and if the effects are not satisfactory, bag filters or other high efficient filters can be used. Low dust wet breaking processes shall be used for the aggregate, moistening the surroundings to reduce dusts and minimize dust pollution.

Use construction machines and transport tools with good conditions. In the handling and transport processes, the cement and other materials shall be transported within tanks in a sealed manner to maintain good sealing conditions and avoid dust contamination during transport.

(3) Fuel gas reduction and control

Strengthen the management of large construction machines and vehicles; machines and equipment will be equipped with corresponding smoke and dust removal devices; and transport vehicles will be equipped with exhaust purifiers. Carry out inspection and maintenance in a timely manner to ensure that the emissions from construction machines and vehicles meet relevant emission requirements. High quality and low pollution fuels shall be used.

(4) Traffic dust reduction and control

Carry out maintenance and repair on a regular basis, and maintenance works shall be strengthened especially to temporary construction roads paved with soil and gravel to prevent pavement damages or dust. Moisten the roads when it doesn‘t rain to reduce dust caused by vehicles.

Carry out greening and landscaping, and plant trees corresponding to soil and water conservation measures at two sides of the roads to reduce dust pollution.

To reduce the impacts of dust caused by construction and transport on local residents, it is planned to employ a sprinkler at the construction site, and it will moisten the positions including excavation sites, blasting sites and two sides of roads at non-rainy days at morning, noon and night repeatedly to reduce the durations and scopes of atmospheric environmental pollution caused by dust.

11.1.1.6 Noise control

(1) Noise source control

The bidding contract shall stipulate that the contractors must use the construction machines and tools with good working conditions and choose the low-noise equipment and processes to reduce the noise level fundamentally. At the same time, they shall strengthen the equipment maintenance and repair to maintain machine lubrication and reduce operating noise level.

Aggregate processing system shall be complete with rubber meshes, plastic plates and damping materials for screening the sand and gravel to reduce noise level.

Damping chassis can be used to reduce the noise level for greatly vibrating machines and equipment, and some flexible soft materials, such as felts and rubber sheets, can also be padded between machine foundation and other structures to reduce the transmission of vibration and thus play a role in isolation.

Make a reasonable arrangement for the construction time, and avoid open-air blasting and comprehensive processing in factories from 22:00 to 7:00 to reduce the impacts on the surrounding construction workers.

Traffic signs or warning signs shall be installed in the sections where the vehicles pass through the neighborhoods and construction worker camps, to limit the driving speed within the construction area. In addition, the construction vehicle drivers shall be informed to minimize whistling at daytime and no whistling at nighttime to avoid impacts of vehicle noises on surrounding residents and construction workers.

(2) Noise prevention for construction workers

To reduce the impacts of noise on the office staff, the building materials of office and living area shall be featured as strong sound absorption, and noise suppression and isolation, with double-glazed windows installed. At the same time a good job shall be done to green the surroundings of office and living area, including the planting of evergreen trees and hedges; and traffic signs or warning signs shall be available in the office and living area.

For strong noise sources, such as concrete mixing, aggregate crushing and aggregate screening, try to improve the degree of automation and realize remote monitoring and operation, which doesn‘t only reduce the headcount of workers, but also make the operators far away from the noise sources.

In the construction processes, when construction workers arrive at strong noisy sites for operations, such as chiseling, drilling, excavation and mechanical driving, personal protective equipment shall be completely available. The bidding contract shall clarify the labor protection provisions related to noise prevention for construction workers, and the contractor shall provide anti-noise earplugs, anti-noise earmuffs, anti-noise helmets and other protective equipment to the construction workers who are under great noise impacts.

11.1.1.7 Disposal of solid wastes

(1) Disposal of domestic wastes

Trash bins in different colors will be available in the construction and living area and the owner‘s camp, and they are used for collecting inorganic and organic wastes. Garbage trucks and cleaners will be available to remove the daily wastes.

The inorganic wastes such as coal ashes and construction wastes shall be dumped respectively at the dam site and the spoil yard near the plant for landfill, and protection, greening and restoration will be available corresponding to soil and water conservation measures for the spoil yard. Remove the wastes from the living camp and construction site on a regular basis, and transport them to designated waste collection stations for landfill as the disposal.

(2) Disposal of construction wastes and production wastes

After construction activities, the temporary camps will be removed in a timely manner; and remove or fill the surrounding domestic wastes, temporary toilets and cesspools, and disinfect with carbolic acid and lime.

The contractor shall appoint full-time workers to collect the production wastes, of which the scrap iron, scrap steel, scrap wood and other debris shall be stacked in a specified location, and the stacking shall be in an orderly manner.

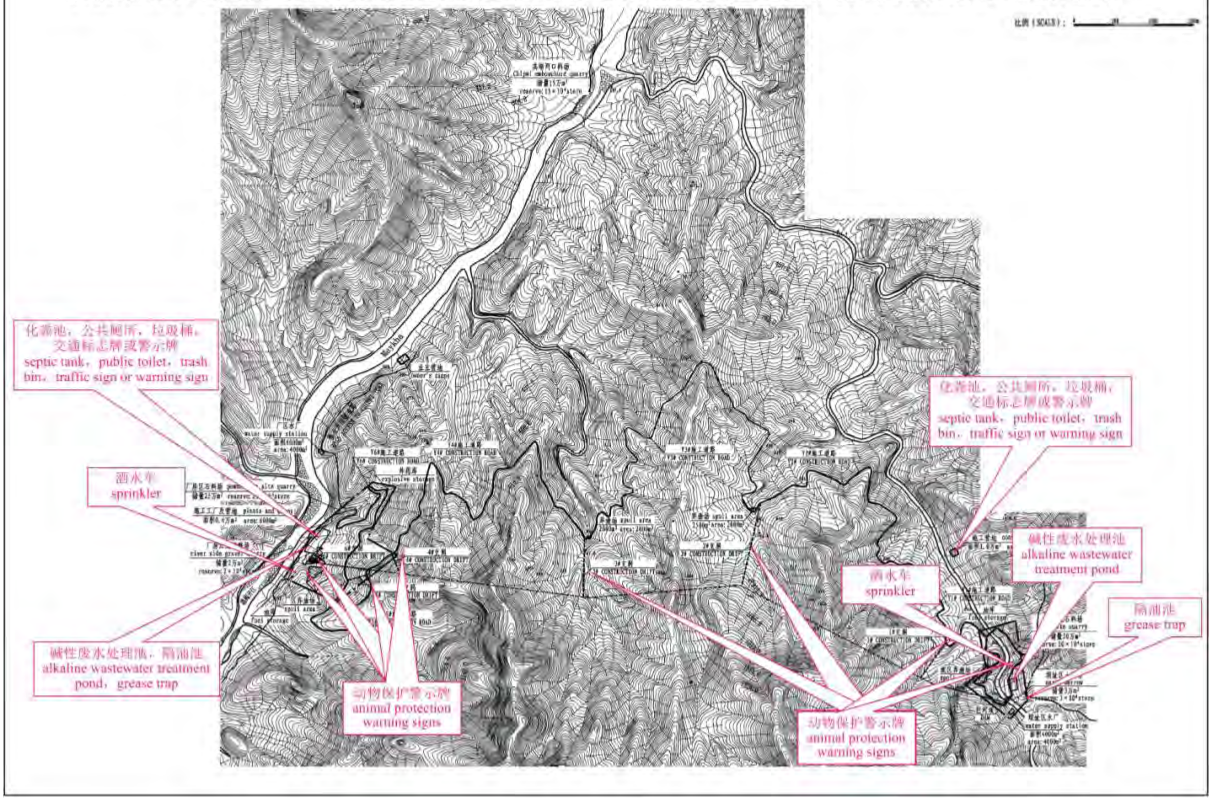
During the transport of building materials, the goods shall be well covered to avoid spilling of sand, gravel or soil, and the main roads shall be cleaned on a regular basis.

11.1.1.8 Geological environment protection

Specific to unstable slopes or rocks, appropriate measures have been provided in the design. The #1, #2 and #4 dangerous rocks are treated with the measures including removal, anchoring and shotcrete.

附图11 电源电站环境保护措施总体布局示意图

FIGURE 11 OVERALL LAYOUT SKETCH MAP OF ENVIRONMENTAL PROTECTION OF CONSTRUCTION POWER PLANT



11.1.2 Implementation of environmental impact mitigation measures

11.1.2.1 Water environment

(1) Construction wastes

During construction, the waste water from the diversion tunnel (drilling, concreting and grouting, etc.), concrete mixing system, sand and gravel pond system (washing facilities, etc.) have high clay content and the pollutants are mainly suspended materials without any toxic nature, so it shall be drained after settlement. The construction waste water can reach the design standards after treatments, and the discharge will not cause water pollution.

The electrical and mechanical equipment installations at dam, electrical and mechanical

equipment installations at the plant, all parking lots and all the maintenance workshops are located on hardened floors. Used oil collection pools are available to collect the used oil for recycling and reusing, so as to prevent the pollution of the surrounding environment due to emission of used oil.

(2) Domestic sewage

In the construction period, the domestic sewage from living activities, canteens, bath rooms and toilets generally do not contain toxic substances, but the level of organics and total phosphorus and total nitrogen content is high and with poor bacteriological indicators, so septic tanks are built up as the primary disposal mean. Septic tanks are available at the living camps and construction camps, and they are made of brick masonry structures and reinforced concrete covers. The domestic sewage can meet the emission standards after disposals, and the discharge will not cause water pollution.

In the operation period, the facilities including septic tanks, sewage treatment equipment and collecting wells are available in the plant to fulfill the requirements of wastewater treatment of permanent facilities. The effluent, after treatment and found qualified, will be discharged into surrounding gullies through buried pipelines, so it will not cause pollution to surrounding environment.

11.1.2.2 Terrestrial ecosystem

The power station is located in the northern region of Myanmar, where is featured as tropical rainforest climate, with dense vegetation and a large number of animals and plants widely distributed in the construction area, of which most of most of the plants and animals are rare species, so it is very important to protect the terrestrial plants and animals, the jobs done for protection are as follows:

(1) Carry out publicity, education and management for the construction workers to improve their awareness on protection of vegetation and wildlife in the construction area;

(2) The vegetation in the construction area has been trimmed prior to construction, and the flowers, grass and trees are not disturbed beyond the scope permitted;

(3) Rules and regulations are formulated, and the wastes are buried deeply in designated areas. No persons kill, shock or catch the fishes in the river without permissions based on our investigations;

(4) The sites temporarily occupied during construction have been recovered after construction activities.

During the construction of the power station, the vegetation is well protected in the construction area, and no rare animals are killed.

11.1.2.3 Water and soil conservation

(1) Main structural area

The water and soil conservation works in the main structural area include slope protection measures for $^{\#}$1-6 permanent openings, plant, tailrace, dam, reservoir and diversion tunnel. The design slope protection measures don't only guarantee the safety, but also brings good soil and water conservation effects.

There are a number of masonry flower beds in the plant, with flowers and grass as the greening; and ditches and greening are available around the buttress foundation platform at left bank and bottom slope protection platform at right bank in the downstream of the dam. The above measures beautify the environment and effectively avoid water and soil erosion.





(2) Construction road zone

The permanent and temporary roads are treated in Chipwi Nge Hydropower Station, including hardening, gravel paving, ditch forming and culvert lying.

1) Combination of permanent and temporary roads

The combinations of permanent and temporary roads include #1 and #2 maintenance tunnel road, left bank road to the dam, right bank road to the dam, transformed road at right bank of the dam, and the road from the dam management camp to the mixing station.

Specific to the combinations of permanent and temporary roads, retaining walls are built up at road sections with unstable slopes; and the drainage systems consisting of ditches and culverts are available at both sides, which protect the road slopes, subgrade and pavements from rain erosion and thus effectively prevent water and soil erosion.









2) Temporary roads

The temporary roads include #2, #4, #5 and #6 adit road, road from the right bank of dam to the foundation pit, temporary construction road at the dam site, and on-site road within the aggregate system. The protective measures include reasonable slope ratio, masonry retaining wall at road sections with steep slopes, gravel paving, temporary longitudinal ditches and horizontal blind drains to ensure smooth drainage and prevent water and soil erosion.

(3) Construction, production and living area

The water and soil treatment measures in the construction, production and living area mainly cover establishment and removal of all construction and living camps (project office camps and labor camps at all contract sections), production facilities (mixing systems, aggregate systems, material stockpiles, processing workshops and material warehouses, etc.). The construction of production facilities (mixing systems, aggregate systems, material stockpiles, processing workshops and material warehouses, etc.) has been carried out with minimization of the vegetation damages, guarantee of the smooth flow of surface runoff, and reduction and elimination of slope erosions.

Construction and living camps (project office camps and labor camps at all contract sections) are built up at the locations where are conducive to living and production activities with minimization of occupation of farmland and vegetation, which has effectively reduced damages to the vegetation. The living camps are built up at the locations where are away from wind blowing while facing the sun, close to traffic facilities and water sources. The camps contain public toilets, wastewater purification tanks and septic tanks, and cleaning is carried out on a regular basis to avoid pollution of the environment caused by domestic wastes and wastewater.

After the completion of the project, some labor camps, mixing systems and material stockpiles will be removed according to the relevant requirements, and then the site will be leveled and vegetation will be restored; some labor camps, as required by Myanmar government, are donated to local villagers as schools, houses and other public facilities; and some living and production facilities are transferred to follow-up constructors in view of road construction needs in future.

(4) Spoil yard

There are a lot of working zones in this power station project, so many spoil yards are established. In order to prevent serious water and soil erosion in the spoil yards, protections in different degrees are provided to the spoil yards according to design requirements and other

relevant provisions. The completion of protective works is as follows:

1) Drainage of spoil yard

Blind ditches, open channels, drains and incepting ditches are available at all spoil yards according to actual needs to ensure smooth drainage and free of debris such as silt or dead wood.

2) Principles of stockpile

The debris shall be stacked and placed according to the planning and the principle of ―retaining first and then confining". After the dumping operations, the top of debris is leveled in order to prevent water and soil erosion. The debris shall be laid in layers and different materials shall be stacked separately, with clear markings to facilitate taking and using of the debris.

3) Protective measures and implementation for the spoil yards

The protective measures include reasonable slope ratio, berms, masonry retaining walls, reinforced gabions and dry masonry works in order to prevent landslides or water and soil erosions. At the same time, blind ditches are available at appropriate positions according to dumping requirements to ensure smooth flow. The slopes of the debris are covered with humus, with grass seeds sprayed, and ivy and other local herbs planted to prevent water and soil erosion due to rainwater flushing.

① Gully spoil yard for # 1 adit

Carry out necessary clearing, leveling and trimming; ditches are formed around the debris; the slope ratio is optimized; berms are formed; and water and soil erosion is avoided. Masonry rocks or reinforced gabions are used to protect the slope toes to ensure stability of the berms and the slope. A layer of fine soil is on the slope and the top, with fragrant eupatorium herb, ivy and banana trees planted, so as to stabilize the water and soil and make the environment green.

② Gully spoil yard for # 2 adit

Carry out necessary clearing, leveling and trimming; ditches are formed around the debris; the slope ratio is optimized; and berms are formed. Masonry rocks or reinforced gabions are used to protect the slope toes to ensure stability of the berms. Finally ivy and other plants easily grow locally are planted on the top and the slope to stabilize the water and soil and make the environment green.

③ Gully spoil yard for # 3 adit

Carry out necessary clearing, leveling and trimming; ditches are formed around the debris; the slope ratio is optimized; and berms are formed. Masonry rocks or reinforced gabions are used to protect the slope toes to ensure stability of the berms and the slope. Finally ivy and other plants easily grow locally are planted on the top and the slope to stabilize the water and soil and make the environment green.

④Spoil yard for # 4 and # 5 adit

Because the spoil yards for # 4 and # 5 adit are located in a deep valley surrounded by dense and strong trees, a natural retaining protection is formed. The site is leveled and ditches are formed on the top and around the debris after completion of works to ensure smooth flow.

⑤Spoil yard for the plant

The spoil yards for the plant include three positions: the spoil yard where Materials Department of 14th Bureau is located , the spoil yard where the camp of 14th Bureau is located, and the spoil yard at the road turning from owner‘s camp to explosives warehouse.

For the spoil yard where Materials Department of 14th Bureau is located, the debris will be stacked along the right gully to the owner's camp. The stockpile slopes are optimized; berms are available on the slopes; rock heap is available as the slope toe protection; intercepting ditches are available around the edges of the stockpile; blind ditches are formed at the bottom of the stockpile along the original terrain, and there are two layers of geotextile on the top of the blind ditch to prevent the fine particles from entering the blind ditch; and the stockpile slopes have been covered by soil excavated for building up owner's permanent camp, of where because the rain is sufficient and vegetation grows rapidly, there are natural vegetation protections on the slope already.

Concrete retaining wall is adopted as the protection at the slope toe for the spoil yard where the camp of 14th Bureau is located, and concrete ditches are available. The slope surfaces flushed by the rainwater earlier already have been greened with vegetation after backfilling and trimming. Reinforced gabions are adopted as the slope toe protection at the slope toes facing the river, and the slope surfaces are protected with grass sowing and trees planting to reduce water and soil erosion.

For the spoil yard at the road turning from owner's camp to explosives warehouse, there are berms on the slopes; reinforced gabions are adopted as the slope toe protection; intercepting ditches are available around the edges of the stockpile; blind ditches are formed at the bottom of the stockpile along the original terrain, and there are two layers of geotextile on the top of the blind ditch to prevent the fine particles from entering the blind ditch. The slope surfaces have been covered with the soil excavated for building the tailrace, and vegetation grows rapidly, so a natural protection is formed, the stockpile top has been leveled and is protected with grass sowing and trees planting to reduce water and soil erosion while make the spoil yard green.









11.1.2.4 Population health

In the construction processes, occupational health and safety management organizations are established and occupational health and safety management systems are developed in all contract sections. The management at all levels from headquarters to all project management offices have established on-site clinics responsible for epidemic prevention, prevention and control of infectious diseases and drinking water inspection to optimize the protection of the health of workers.

(1) Clinics are available at all contract sections, and a number of medical personnel are ready to provide healthcare and epidemic prevention services. A certain number of epidemic prevention medicines and general emergency medicines are in place in each clinic.

(2) Sufficient trash bins are available at the construction site and the living camp, and construction wastes and domestic wastes will be delivered into the trash bins. The wastes are transported to the garbage stations for landfill deeply and prevent infectious diseases caused by construction wastes or domestic wastes.

(3) Make a unified planning for the layout of living area and production facilities, with flowers and trees planted as the camp greening to create a good production and living environment.

(4) Provide routine physical examinations to construction workers prior to their arrival, and it is prohibited to allow the patients with infectious diseases to enter the construction site. Distribute the drugs against malaria, dengue fever and other infectious diseases to the construction workers on a regular basis, and the living camps are sprayed for disinfection on a regular basis to effectively prevent the occurrence and spread of infectious diseases.

(5) Drinking water purification systems are established in all living camps, and the workers shall not drink the water until the water is purified and found qualified to ensure the safety of living drinking water.

(6) Full-time sanitation staff is available in the construction area and living area, and sanitation systems are developed. On-site cleaning and wastes removing will be carried out on a regular basis everyday. Strengthen publicity and education, and it is prohibited to dump wastes in the working area, living area and surroundings to ensure the sanitation conditions.

(7) Carry out sanitation inspection and assessment activities, and an environmental sanitation inspection is carried out on a monthly basis to provide awards and punishments according to the performances, so as to improve the enthusiasm of all construction workers to participate in environmental protection.

By vigorously implementing various preventive measures, there are no any occurrences of large-scale infectious diseases or any cases of death due to infectious diseases from the commencement to finishing of the power station project.









11.1.2.5 Atmospheric environment

In the construction process of Chipwi Nge Hydropower Station project, the emissions of dust, waste gases and harmful gases have been controlled effectively, and associated health hazards have been avoided successfully.

(1) The blasting methods are well selected and optimized to minimize the generation of dust, which has reduced the impacts of dust on the surrounding environment and construction personnel.

(2) In addition to masks and other necessary personal protective equipment to reduce dust generated by construction activities, the methods including moistening and ventilation have been adopted to reduce the dust hazards to a minimum degree.

(3) The fine materials and bulk materials, which can lead to dust easily, are well covered with canvas, cloth and other covering materials during transportation, and the driving speed has been well controlled to effectively prevent impacts on the surrounding environment due to flying dust.

(4) A sprinkler is available to moisten the construction roads on a regular basis, and the construction roads are maintained wet to an appropriate degree, so as to prevent impacts on surrounding environment due to traffic dust.

(5) The construction wastes have been disposed by mean of landfill and burning is strictly prohibited, which has ensured the air quality and prevented air pollution due to emissions .

11.1.2.6 Noise control

Production and construction noise level control measures are in place, and the noises don‘t

make any negative impacts on the camp workers, on-site construction workers and surrounding residents. The major measures include:

(1) The machines and equipment are used in the construction process in line with the noise and vibration levels stipulated in the existing national standards, and personal noise reduction equipment shall be in place at the high noise area to reduce the hazards caused by the noises to construction workers.

(2) Temporary production facilities and sites, such as mixing stations, material processing plants and generators are located far away from the living camp, which prevents the disturbances on normal living and working activities by construction noises.

(3) Strengthen the equipment maintenance and repair while maintain mechanical lubrication to achieve the purpose of noise reduction.

(4) Make a reasonable arrangement for the operation time, and try to avoid open-air blasting during rest time, so as to prevent impacts on normal living activities by blasting noises and vibrations.

11.1.2.7 Solid waste disposal

The solid wastes generated in the power station project include debris, construction wastes and domestic wastes. The disposal is completed as follows:

(1) Debris

The debris comes from the construction activities for the dam, plant, adit and diversion channel. The debris will be transported to the designated to spoil yard according to design requirements. There are drainage ditches at the spoil yard, and reinforced gabions are available to protect the slope toe and prevent water and soil erosion.

(2) Construction and domestic wastes

Sufficient trash bins are available at living camp, dam construction area and plant construction area, and construction wastes and domestic wastes will be delivered into the trash bins. The wastes will be removed from the living camp and construction area on a regular basis, and then transported to the garbage stations for landfill deeply. The medical wastes will be disinfected in a concentrated manner and transported to the garbage stations for landfill deeply to effectively prevent environmental pollution.

11.1.2.8 Geological environment protection

The #1, #2 and #4 dangerous rocks are treated with the measures including removal, anchoring and shotcrete in the power station project.

11.1.3 Implementation evaluation

Based on the comparison and analysis of the actual implementation of environmental protection measures against the design and planning requirements, the main conclusions are:

(1) The implementation of water environment protection measures, ecological environment protection measures, population health protection measures, acoustic environment protection measures and solid waste disposal measures are basically as same as the design and planning requirements.

(2) As to soil and water conservation measures, the implementations at main structural area, construction road area, construction, production and living area and spoil yard are basically as same as the design and planning requirements; but the protective measures for the excavation site are not well implemented.

11.2 Environmental management

As an international or transnational river development project, the realization of ―protect during development and develop during protection" in the process of development of the hydropower resources in Myanmar determines the international image of the project investment enterprise, and management is an important part of environmental management of hydropower development and an important link in implementing environmental protection measures. To maximize the social, economic and environmental benefits of Chipwi Nge Hydropower Station, protect the ecological environment of the project area and maintain the international image of investment enterprise, it is very necessary to do a good job at environmental management. The project investment enterprise shall establish a specific environmental management agency which is responsible to complete the tasks of environmental management.

11.2.1 Environmental management department

It is planned to establish an environmental protection department, with 1-2 full-time employees and some part-time employees, which is responsible for unified leadership and organization for environmental protection works in the construction period.

11.2.2 Environmental management tasks during construction

(1) Develop planning and management approaches for environmental protection in construction stage

At the same time of establishment of environmental management departments, environmental protection planning and management approaches are developed according to environmentally sensitive issues involved in management, locations of environmental protection, implementation time and surrounding environmental requirements corresponding to environmental impact assessment reports and specific to the focuses and difficulties, which clarify the management objectives, tasks and focuses, with corresponding management systems and rules determined.

(2) Develop annual environmental protection plans, including environmental investment plans

According to relevant construction schedules and the work focuses detailed in tender documents, a scientific environmental protection plan is developed, which effectively controls the project progress.

(3) Organize tendering for specific environmental protection tasks

Participate in the tender and design review; participate in qualification of bidding companies; help relevant companies to carry out site visit, Q&A and other pre-bidding works; participate in the evaluation of bids.

(4) Take responsibilities for compilation and review of environmental protection clauses detailed in the tender documents and contracts, and ensure that the environmental measures closely related to construction activities have been included into the tender documents and contracts.

According to the environmental impact assessment reports and environmental designs approved already, break down the detailed environmental protection measures to specific tender documents and contracts; review the tender documents and contracts developed already, and provide modification opinions on the environmental protection measures if there are some environmental protection measures are not sound enough.

(5) Supervise the implementation of the contractor's environmental measures

Manage the contracts related to environmental protection during construction, and review the

qualifications of the subcontractors. Help to inspect and eliminate the projects and persons involved in illegal subcontracting by the contractor, and stop illegal subcontracting actions. Review the design documents to be submitted by the contractors according to environmental protection contracts; review the construction planning prepared by the contractors on environmental protection works; and inspect the implementation of construction preparations carried out by the contractors.

(6) Supervise and inspect the operation of environmental protection measures related to construction

Coordinate the works of designers, constructors and supervisors, urge the contractors to respect the opinions of designers and realize the design intents; timely organize to study the relevant opinions and comments proposed by the contractors, and ask the designers to reply in writing after consensuses are reached, or confirm in a form of ―minutes of meeting"; coordinate to solve the contradictions between designers and contractors, and ask the designers to timely deal with the design problems proposed by the contractors in a timely manner.

(7) Help the constructors to deal with environmental disputes and environmental pollution accidents related to construction activities, and make timely reports to superiors or the relevant administrative departments.

Provide active services for construction activities based on contracts while adhere to the philosophy of fairness and justice, and actively coordinate the relations among all parties, deal with environmental pollution accidents and pollution disputes in a timely manner, and make timely reports to superiors or the relevant administrative departments after investigations and studies.

(8) Organize to implement environmental supervision and environmental monitoring works, and prepare and submit environmental quality reports of the construction area.

1) Review the qualifications of environment supervisors; verify the supervision certificates of the supervisors; and monitor and examine the environmental supervision procedures and quality management.

2) Review the qualifications of the monitoring companies or departments; ask the monitoring companies or departments to establish quality assurance systems; and supervise the processes including monitoring, sampling, sample storage and transportation.

3) Verify the monitoring reports issued by the monitoring companies or departments, to analyze the reliability of monitoring results and the environmental problems reflected from the monitoring results.

4) Monitor the performances of environmental protection and water conservation measures through appropriate utilization of the monitoring results, and find the prominent environmental problems from the monitoring results, and urge the contractors to develop and implement appropriate solutions.

5) Establish a regular reporting system for monitoring data, and guide and manage the environmental protection works of constructors according to the monitoring data.

6) Organize emergency treatments to pollution accidents according to the monitoring data.

(9) Prepare annual report of the environmental protection works

Participate in the monthly production meeting held by the company to summarize the completion of the environmental protection works in this month and propose the problems existed in environmental protection works, so as to negotiate with the supervisors, designers and contractors for working out solutions, and propose the requirements on the environmental

protection works in the next month.

The environmental management agencies can individually hold a special meeting of environmental protection to summon all relevant parties to negotiate the important environmental issues involved in construction to reach consensus and determine the programs to solve the problems after discussions.

Develop monthly, quarterly and annual reports according to the environmental protection plans with considerations of the monthly progress of project. Develop annual report of the environmental protection works according to the problems detailed in the monthly, quarterly and annual reports, the problems occurred, and experiences in dealing with the problems.

(10) Organize to carry out publicity, education and training of environmental protection

By issuing leaflets, setting up billboards and watching video, to provide publicity, education and training of environmental protection to construction workers and supervisors, so as to raise their awareness of environmental protection.

(11) Organize to prepare completion and acceptance report of environmental protection

Participate in and organize the completion and acceptance of the environmental protection works, including acceptance according to the contracts signed and design drawings as well as strict quality control together with consultants and project supervisors. The acceptance documents shall be signed and a completion and acceptance reports shall be developed according to the results. Urge the relevant parties to correct and report to superiors if there are any items found not qualified.

(12) Archive and transfer environmental protection information and results

Archive the environmental protection results achieved in the environmental management works, including management plans; planning; monthly, quarterly and annual reports; annual summaries; supervision data; monitoring data; design contracts; purchase contracts; contractor contracts; correspondences with superiors; correspondences with designers, contractors, local environmental protection authorities; and staff training information.

11.2.3 Environment management tasks in operation periods

(1) Implement environment management measures and develop management practices and systems in operation periods of the project.

(2) Help the Myanmar authorities to carry out environmental protection works, and participate in ecological protection works and reservoir cleaning works prior to water storage of the reservoir.

(3) Implement environmental monitoring in the operation periods, and analyze the results statistically.

11.2.4 Environmental management system

(1) Environmental quality reporting system

Environmental monitoring is an important tool to access to environmental information and an important basis of implementation of environmental management and environmental protection measures. The power station ecological and environmental monitoring can be contracted by qualified companies or departments by the owner, and they can carry out monitoring for the power station environmental quality according to the monitoring plan.

A project ecological and environmental monitoring system consists of monthly reports, annual reports, periodic environmental quality reports and annual evaluation, and the monitoring results are submitted to the owner to enable them to keep abreast of the project environmental quality conditions and use them as the basis for determining countermeasure

for local environment.

(2) Acceptance system

An acceptance system, featured as keeping a same pace with design, construction and operation, shall be observed for the facilities for prevention of pollution and other public hazards. These facilities shall not be put into operation until found compliance with contract requirements and accepted by relevant authorities. Pollution prevention facilities shall not be dismantled or left idle without permissions.

(3) Publicity and training system

The environmental management departments shall often publicize environmental knowledge to enhance environmental awareness through various channels including radio, television, newspapers, billboards and seminars, and make the workers participate in environmental protection works consciously; some expenses shall be included in the budget to award the departments and persons who make great contributions to environmental protection works in this project; and organize to provide training to professional and technical personnel involved in environmental protection to improve their professional quality.

(4) Pollution accident prevention and treatment measures

If some pollution accidents or other unexpected events occur during construction and operation, in addition to measures immediately taken by the departments who cause the accidents, timely notifications shall be provided to the regions and residents facing pollutions, and reports shall be submitted to the environmental management agencies of employer for investigation and treatment. The relevant departments of the owner, after receipt of the notifications of accidents, shall adopt emergency measures to promptly organize to deal with pollution accidents. At the same time, it is necessary to investigate the accidents to find out the causes, departments responsible and persons responsible, and financial penalties can be given to relevant departments and persons.

11.2.5 Implementation of environmental management measures

In the construction and operation period of Chipwi Nge Hydropower Station, the owner and constructor has established relevant organisms according to the environmental management requirements proposed by the assessor, and assumed the corresponding environmental management tasks.

The construction company of this construction power station is a permanent foreign branch of CPI Yunnan Power Investment Co., Ltd., and it is responsible for realizing the responsibilities of the owner. The construction company organizes the construction of this construction power station under the supervision and control of the supervisor according to the design to form a uniform and complete management system.

The main structural works of the construction power station are included in two contract sections respectively undertaken by China Gezhouba (Group) Corporation and Sinohydro Bureau 14 Co., Ltd.， and their project management offices assume environmental protection and water and soil conservation works within their contract sections.

11.2.6 Environment management content in operation periods

Because of the hydropower station is a non-pollution projects, during the operation periods of hydropower station, the environmental mitigation measures are relatively less.During the operation of Chipwi Nge Hydropower Station, the main contents of environmental management including the establishment of specialized environmental management agency,the implementation of the environmental mitigation measures and the establishment of environmental management and supervision system. The content are shown in Table 11.2-1.

Table 11.2-1 Main content of Environment management in operation periods

Item	Main content	Implementers	Supervisor
Mitigation measures	To establish specialized environmental management agency	CPI	Local Gov., NGO, Local people
	a discharging ecological flow of 0.53m3/s	Contractor	Local Gov., CPI, NGO, Local people
	transplanting for saplings and nursing for big trees	Contractor	
	Further investigate the terrestrial organisms on a regular and irregular basis	Contractor	
	Environmental monitoring	Contractor	
	By taking a series of measures to promote education and training, to raise the public awareness to environmental protection	CPI	Local Gov., NGO, Local people
Method and regime	To develop Risk accident emergency plan	CPI	Local Gov., NGO, Local people
	To develop Environmental management method and regime	CPI	
environmental supervision	Supervise and inspect the implementation of environmental planning and operation of environmental protection measures	CPI	Local Gov., NGO, Local people.
	supervise and inspect ecological and environmental monitoring works in the reservoir and downstream areas	CPI	
CSR fund	After consultation with MOEP, we have agreed to allocate 1% of the project's profit to CSR fund.	CPI	Local Gov., NGO, Local people.

11.3 Environmental supervision

(1) Organizational structure

Environmental supervision is an important part of the environmental management, and it is featured as independence relatively, the owner entrusts the companies and departments with relevant qualifications independently according to the contract and relevant design documents.

(2) Environmental supervision in the construction period

According to the construction environmental requirements, it is necessary to review the construction management plan, construction program, construction schedule, construction changes and completion applications from an environmental point of view. Specific comments will be proposed to the environmental plans and environmental measures proposed by the constructors.

Supervise the implementation of the environmental protection measures in the construction processes, and issue instructions of modifications specific to the circumstances which violate environmental requirements or may harm the environment.

Participate in project design disclosures and on-site routine meetings, and summarize the environmental protection works in all construction stages.

Supervise and inspect the self-inspection of environmental protection works carried out by all constructors. Review the environmental quality reports submitted by the constructors, supervise the utilization and operation of the environmental protection funds, and participate in acceptance in different stages and at the completion time. Sign on the environmental comments on the payment applications according to the implementation of environmental

protection measures and the construction of environmental protection facilities, environmental conditions at the construction area, and the environmental protection acceptance results in different stages.

Do a good job at supervision logs to maintain its integrity and accuracy, and establish environmental supervision archives to well manage the environmental management results and information. Submit monthly reports, annual reports and annual summaries to the project environmental management departments.

(3) Environment supervision in the operation periods

Supervise and inspect the implementation of environmental planning and operation of environmental protection measures, with focuses on the operations of ecological and environmental protection facilities, and supervise and inspect ecological and environmental monitoring works in the reservoir and downstream areas. Corrective and adjustment opinions are timely proposed if any problems are found.

(4) Environmental supervision work system

Environmental supervisors will stay at the site to carry out a dynamic management for environmental protection works involved in construction activities. Environmental supervision works mainly include site visits, supplemented by the necessary environmental monitoring. According to the distributions of pollution sources and construction sites, the environmental supervision engineers carry out daily inspections of construction areas. If there are any environmental pollution problems found from inspections, Environmental Supervision Directives will be issued to the contractors to ask them to solve within a time limit, or to solve immediately in emergency situations. Environmental supervision engineers regularly check and accept the works, and will issue a notice of default to require the contractors to modify within a time limit.

(5) Implementation of environmental supervision works

In the construction processes of the power station project, to ensure the properly and orderly conduct of environmental protection and water & soil conservation works, a quality management leadership team headed by chief supervisor, and a environmental protection and water & soil conservation works management mechanism is established in the supervision center, with quality control objectives determined, corresponding supervision planning and supervision rules prepared, supervisors staffed according to the characteristics of the construction activities, and job responsibilities and work systems formulated.

During the construction processes of the power station project, all relevant parties have always implemented the laws, rules and regulations on environmental protection issued by China and Myanmar government and the contract requirements, which has effectively prevented water and soil erosion and water sources pollution, properly handled the garbage, waste debris, waste water and sewage, protected the health of construction workers and the residents living in surrounding environment, minimized the negative impacts caused by construction activities on surrounding environment, and satisfied the requirements of environmental protection and soil and water conservation .

11.4 Environmental monitoring

11.4.1 Monitoring purposes and tasks

Environmental monitoring objectives and main tasks are:

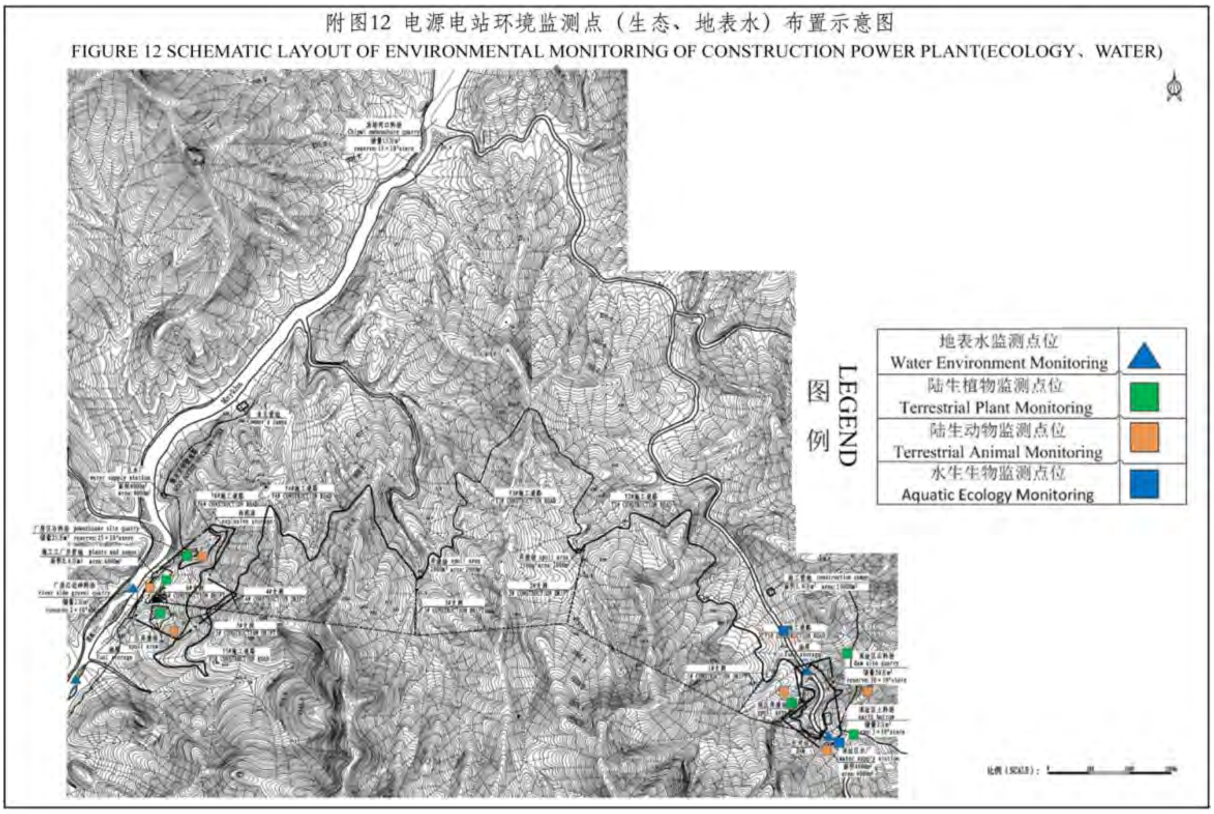
1) Provide basic information for environmental protection of this project. Carry out systematic and continuous monitoring and investigation to the ecological environment prior to

and after the construction activities, so as to provide reliable data and information for environmental pollution control and environmental management during construction and operation, and for the environmental protection works and environmental impact assessment specific to the gradual development of the watershed.

2) Provide a scientific basis for the project‘s regional ecological environment improvement. There are no any complete and systematic environmental monitoring systems in ChipwiRiver, and the monitoring results from the power station‘s environmental monitoring system can provide a scientific basis for the development research and watershed ecological environment improvement.

11.4.2 Monitoring scope

The monitoring scope is determined according to the characteristics of construction activities and local environment with the impacts of the project activities on the local environment taken into account, including: water environmental monitoring, atmospheric monitoring, sound environmental monitoring, terrestrial monitoring, aquatic monitoring, soil and water conservation monitoring and population health monitoring. The layout of the environmental monitoring is as the followingfigure.



(1) Water quality monitoring

1) Surface water quality

Setting of monitoring sections: There are totally 4 monitoring points，including intake of diversion tunnel; 1000m downstream of the dam; 100m upstream of the tail water of powerhouse; 1000m downstream of the tail water of powerhouse.

There are totally 19 monitoring items: pH, water temperature, suspended matter, dissolved oxygen, 5d biochemical oxygen demand, potassium permanganate index, ammonia nitrogen, nitrate, total nitrogen, total phosphorus, plumbum, chromium (hexavalence), cyanide, cadmium, petroleum, volatile phenol, arsenic, hydrargyrum, intestinal bacteria of human

excrement.

Monitoring frequency and time: monitoring once before construction; monitoring once for high water period, level period and low water period respectively during construction period each year.

Monitoring technical requirement: According to relevant rules in Technical Specifications Requirements for Monitoring of Surface Water and Waste Water (HJ/T91-2002).

2) Production sewage

Setting of monitoring points: There are totally 4 monitoring points, including 2 at discharge exits for waste washing water of machinery parking lots (dam site area and powerhouse area); 2 at discharge exits for waste water of concrete mixing system (dam site area and power house area) respectively.

Monitoring items: pH value, suspended matter and flow are selected as obligatory items; petroleum should be the additional item for monitoring the discharge exits for waste washing water of machinery parking lots; other items could be added or deleted according to the variation of pollutants in construction sewage.

Monitoring frequency: once each quarter during construction period.

Monitoring method: According to relevant rules in Technical Specifications Requirements for Monitoring of Surface Water and Waste Water (HJ/T91-2002).

3) Domestic sewage

Setting of monitoring points: one for each discharge exit for domestic sewage of camp buildings (dam site area and power house area) respectively.

Monitoring items: chemical oxygen demand, 5d biochemical oxygen demand, ammonia nitrogen, total coliform, and flow, etc.

Monitoring frequency: once each quarter during construction period.

4) Sources of drinking water

Setting of monitoring points: one for each intake of drinking water for camp buildings (dam site area and power house area) respectively.

Monitoring items: primary items in Water Quality Standard for Drinking Water Sources (CJ3020-93).

Monitoring frequency: once each month during construction period.

(2) Ambient air quality

Setting of monitoring points: one for each camp building (totally 2 camp buildings). Monitoring items: sulfur dioxide, total suspended particles, nitrogen dioxide (totally 3 items).

Monitoring frequency: once each quarter during construction period.

Monitoring method: according to the rules in Technical Specification for Environmental Monitoring.

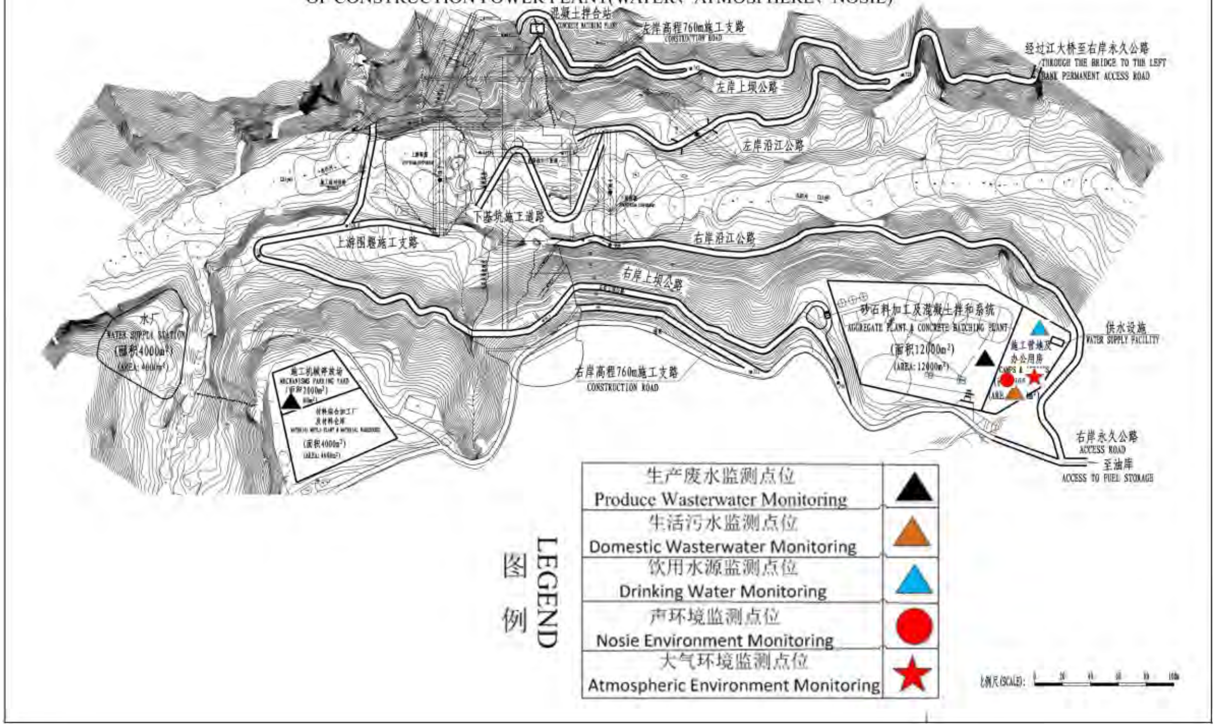
(3) Noise

Setting of monitoring points: one for each camp building (totally 2 camp buildings). Monitoring frequency: once each quarter.

Monitoring method: according to the rules in Technical Specification for Environmental Monitoring.

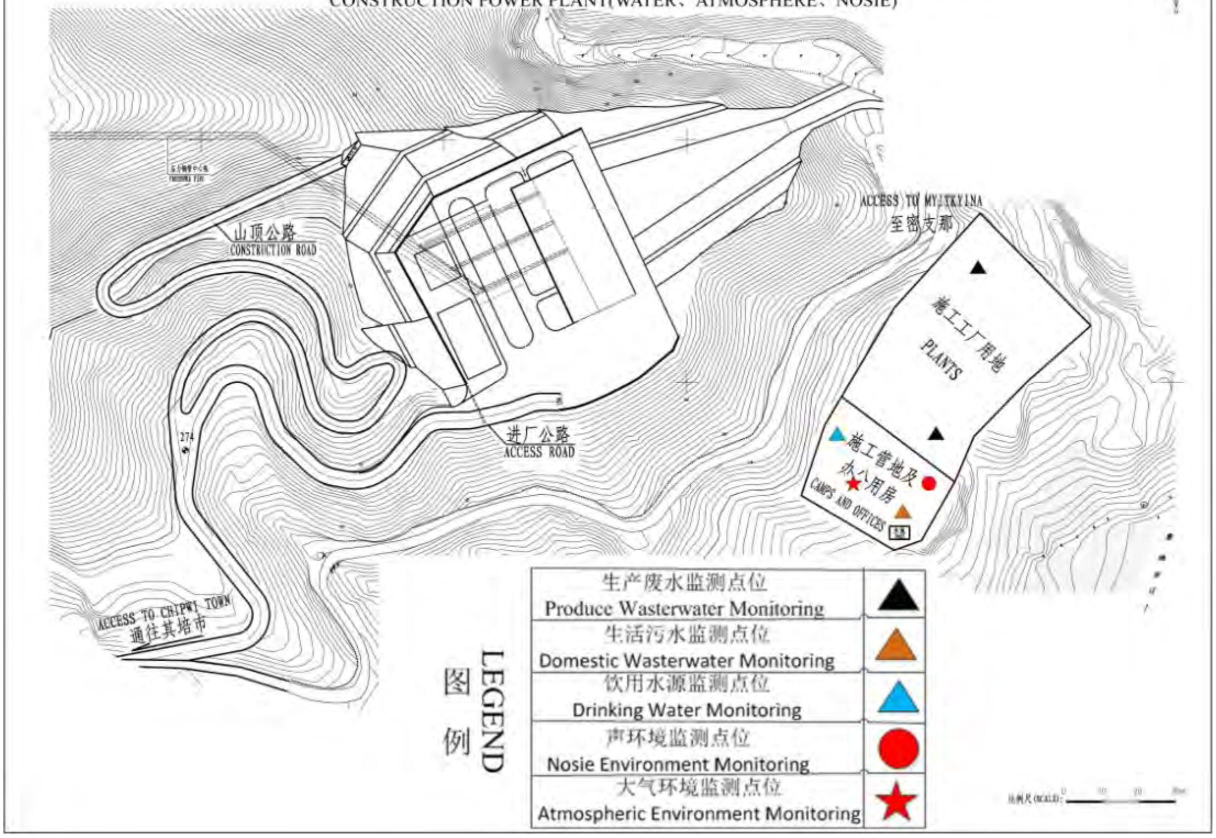
附图13 电源电站坝址区环境监测点（水、气、声）布置示意图

FIGURE 13 SCHEMATIC LAYOUT OF ENVIRONMENTAL MONITORING OF DAM SITE OF CONSTRUCTION POWER PLANT(WATER、ATMOSPHERE、NOSIE)



附图14 电源电站厂址区环境监测点（水、气、声）布置示意图

FIGURE 14 SCHEMATIC LAYOUT OF ENVIRONMENTAL MONITORING OF POWERHOUSE OF CONSTRUCTION POWER PLANT(WATER、ATMOSPHERE、NOSIE)



(4) Terrestrial

1) Terrestrial plant monitoring

Setting of monitoring points: 6 monitoring points at the dam site and powerhouse site, and two sample plots for trees, shrubs and grass at each monitoring point.

Monitoring items: phytobiocoenose characteristics, including coverage, structure, biomass and plant species.

Monitoring time and frequency: a total of five times, including once prior to commencement of the project; once at the third year since commencement of the project; and once respectively at the first year, third year and fifth year since operation.

2) Terrestrial animals monitoring

Setting of monitoring points: coordinated with the terrestrial plant monitoring, 6 monitoring points at the dam site and powerhouse site, and some line-transects are available representing different types of ecosystems at each monitoring point.

Monitoring items: the quantity, distribution and habitat conditions of mammals, birds, amphibians and reptiles.

Monitoring time and frequency: a total of five times, including once prior to commencement of the project; once at the third year since commencement of the project; and once respectively at the first year, third year and fifth year since operation.

(5) Aquatic monitoring

Setting of monitoring points: one monitoring point respectively at the reservoir tail and at 2km from the dam.

Monitoring items: mainly fish population structure and amount of resources.

Monitoring time and frequency: a total of five times, including once prior to commencement of the project; once at the second year since commencement of the project; and once respectively at the first year, third year and fifth year since operation. Investigate the aquatic ecological conditions once for high water period, level period and low water period respectively during the investigation year.

(6) Water and soil erosion monitoring

Setting of monitoring points: spoil yard, borrow site, construction site, adit, roadside of construction roads, etc.

Monitoring content: amount of soil erosion, hazard of soil erosion, benefits of soil and water conservation, etc.

Monitoring method: ground monitoring or investigation monitoring.

Monitoring period: construction period and recovery period of forest and grass.

(7) Population health monitoring

Contents of monitoring: mainly focusing on malaria, dengue fever and other infectious diseases within the construction area, and quarantine will be provided to the construction workers at epidemic seasons and high risky areas according to the monitoring conditions of infectious diseases.

Scope of monitoring: construction workers within the construction area.

Monitoring time: quarantine will be provided to the construction workers annually in the construction periods.

11.4.3 Implementation of monitoring works

During the progress of this construction power station, the employer has carried out water

environmental monitoring and water & soil erosion monitoring according to the preliminary investigations, but the monitoring points and monitoring indicators are not complete corresponding to the planning and design; it is necessary to further strengthen environmental monitoring in the operation period of the construction power station.

11.5 Environmental protection investment

11.5.1 Descriptions of preparation

In principle, the estimated investment in environmental protection should be based on the relevant Myanmar norms and standards, but because Myanmar doesn‘t have relevant norms and standards, the estimates are prepared according to relevant China norms and standards.

Given that environmental protection is an integral part of the main structural works in this project, the preparation of estimates of environmental protection investment corresponds to the estimates of investment in main structural works, of which the basis, price level, baseline year and major material prices are as same as the items used in the estimates of investments in main structural works, and relevant industrial norms or rules shall prevail if there are some contents not involved in the main structural works.

11.5.2 Basis of preparation

(1) ―Rules for Preparation of Budget in Hydropower Engineering Design” (2007 edition)

(2) ―Circular Issued by the State Planning Commission and the State Environmental Protection Administration on Regulating the Environmental Impact Consulting Costs” (*Jijiage* [2002] No. 125);

(3) ―Circular Issued by the State Planning Commission and the Ministry of Finance on Aquatic Wildlife Conservation Cost standards and Related Issues" (*Jijiage* [2000] No. 393);

(4) ―Procedures of Preparation of Estimates of Investments in Environmental Protection in Water Resources and Hydropower Engineering” (SL359-2008);

(5) ―Regulations of Preparation of Budgets (Estimates) of Investments in Water and Soil Conservation in Development and Construction Projects” (Ministry of Water Resources, *Shuizong* [2003] No. 67);

(6) ―Regulations of Engineering Survey and Design Costs” (State Planning Commission and Ministry of Construction, *Jijiage* [2002] No. 10);

(7) ―Quota for Estimates of Investments in HydropowerConstruction Project” (*Dianshuigui*[1997] No. 031);

(8) ―Quota for Estimates of Investments in HydropowerEquipment Installation Project” (*Guojingmao*[2003] No. 38);

11.5.3 Investment estimates

The environmental protection investment is estimated as 20.8445 Million Yuan in Chipwi Nge Hydropower Station, of which the investment is 4.2685 Million Yuan specific to environmental protection, and the investment is 16.5760 Million Yuan specific to water and soil conservation. The specific breakdown of investment is detailed in Table 11.5-1.

Table 11.5-1 Table of estimates of environmental protection investment

No.		Unit	Unit price(Yuan)	Number	Investment (_0000 Yuan)	
Part I Environmental protection measures						
Part II Environmental monitoring					73.9	
1.	Water quality	Point · time	2000	138	27.6	A total of 29 is considered

	monitoring					
2.	Ambient air quality monitoring	Point · time	2500	18	4.5	
3.	Noise monitoring	Point · time	1000	18	1.8	
4.	Terrestrial monitoring				10	
1)	Terrestrial plant monitoring	Time · year	10000	5	5	
2)	Terrestrial animal monitoring	Time · year	10000	5	5	
5.	Aquatic monitoring	Time · year	20000	15	30	
6.	Water and soil erosion	Point · time				Included in the water protection investment
Part III Environmental equipment and installation					10.72	
1.	Environmental protection equipment				10.72	
1)	Trash bin	No.s	800	9	0.72	
2)	Septic tanks	No.s	30000	2	6.00	
3)	Temporary toilet	No.s	20000	2	4.00	
4)	Mixing plant dedusting equipment					Included in the project investment
Part IV Temporary environmental protection measures					141.865	
1.	Wastewater and sewage treatment				23.26	
1)	Alkaline wastewater treatment	_0000 m^3	8000	6.23	11.98	Including 70000 Yuan infrastructure investment
2)	Oily wastewater treatment	_0000 m^3	10000	3.28	8.28	Including 50000 Yuan infrastructure investment

Table 11.5-1 Table of estimates of environmental protection investment(continued)

No.		Unit	Unit price(Yuan)	Number	Investment (_0000 Yuan)	
3)	Foundation pit wastewater treatment				3	
2.	Noise protection				0.04	
1)	High noise protection for construction workers					Included in the project investment
2)	Transport vehicle noise warnings	No.s	100	4	0.04	
3.	Solid waste disposal				55.54	
1)	Rubbish and excrement removal	Person/month	5	830	12.04	29 months considered
2)	Garbage landfill	_0000 m^3	100	653	6.53	
4.	Ambient air quality protection				4.2	
1)	Watering	Months	3000	14	4.2	14 months considered
5.	Population health protection				58.825	
1)	Construction workers cleaning and disinfecting	hm^3	3000	2.7	22.68	29 months considered
2)	Temporary clinic	No.s	50000	2	10	
3)	Construction workers quarantine	Person · time	120	830	9.96	
4)	Rodent and mosquito killing costs	Person · year	15	830	3.735	3 years considered
5)	Drugs to prevent malaria and other diseases	Person · year	50	830	12.45	3 years considered
6.	Ecological protection				3.5	
1)	Public education	Year	10000	3	3	
2)	Warning sign	No.s	500	10	0.5	
Total costs of Part I ~ Part IV					226.49	
Part V Independent environmental protection costs					176.21	
1.	Environmental management costs in construction period				43.59	
1)	Environmental management recurrent costs				9.06	4% of the total of I～IV considered
2)	Acceptance costs of environmental protection facilities				30	
3)	Environmental protection publicity costs				4.53	2% of the total of I～IV considered
2.	Environmental supervision costs	Person/month	5000	1	14.5	29 months considered
3.	Research, survey and design costs				118.12	
1)	Environmental impact assessment costs				100	

Table 11.5-1 Table of estimates of environmental protection investment(continued)

No.		Unit	Unit price(Yuan)	Number	Investment (_0000 Yuan)	
2)	Environmental survey and design costs				18.12	6% of the total of I～IV considered
Total costs of Part I ~ Part V					402.69	
Basic reserve funds					24.16	6% of the total of I～V considered
Special environmental investment					426.85	
Special soil and water conservation investment					1657.6	
Environmental protection investment					2084.45	

12 Assessment conclusions and recommendations

12.1 Assessment conclusions

The overall assessment on environmental impact of the construction power plant is concluded as follows:

Main positive impacts: the main tasks of the construction power station is originally to supply construction power for developing Myitsone and Chipwi Hydropower Stations at Ayeyawady River. At present, because of the changes of external conditions, it shall provide power to ChipwiTown and Myitkyina after the adjustments. The construction of the power station will provide sufficient power to Chipwi Town and Myitkyina, so as to solve the long-term power deficiency problems locally; it may improve regional power and traffic infrastructure conditions and facilitate production and livelihood of local people to provide facilities for poverty alleviation and well-off; it may increase local fiscal revenue and promote sustainable development of regional social economy. At the same time it will play an important role in developing the water resources of AyeyawadyRiver.

Main negative impacts: project construction, reservoir inundation, occupation of land and dam blockage may affect the integrity of regional ecosystem, terrestrial animals and plants, aquatic lives, etc. Construction of this project will intensify soil erosion of the construction area in a short period. This station provides diversion generation that will result in flow reduction of the natural channel between the dam behind and power house (15.7km), and this may affect aquatic ecologic environment of that river section. However, it has been considered that an ecological flow of 0.53m^3/s discharging through release hole during operation period. Directly discharging the waste (polluted) water without treatment during construction period could affect the water quality of ChipwiRiver.

In addition, noises, waste gases and waste debris generated during the construction periods will impact on the surrounding environment; the construction activities will impact on the health of construction workers. These impacts are only limited to construction periods, and they will be reduced or mitigated with the construction progress and implementation of environmental protection measures.

For negative impacts described above, measures of environment protection provided include: water and soil conservation, ecologic environment protection, construction waste (polluted) water treatment, solid waste treatment, atmospheric environment protection, population health protection, etc.

To sum up, these negative impacts on environment by project construction and operation will be minimized after measures of environment protection being provided and there are not restrict factors that may affect project decision in respect of environment protection.

12.2Suggestions

(1) It is recommended to strengthen publicity of hydropower development in Myanmar, Kachin, to introduce the cases which hydropower development drives local economic development and improves the living standards, so as to further address the concerns of local residents.

(2) It is recommended to further improve environmental monitoring, tracking and evaluation in the operation stage of the power station.

Power Purchase Agreement
Contract No.:2/PPA (Chipwi Nge)/2017

Between

Ministry of Electricity and Energy
Electric Power Generation Enterprise
(Party A)

And

Chipwi Nge Hydropower Co.,Ltd.
(Party B)

For

Chipwi Nge Hydropower Plant

Venue: Nay Pyi Taw
Date : ,September ,2017

Power Purchase Agreement

Contract No. : 2/ PPA (Chipwi Nge)/ 2017

Between

Ministry of Electricity and Energy

Electric Power Generation Enterprise

(Party A)

And

Chipwi Nge Hydropower Co., Ltd.

(Party B)

For

Chipwi Nge Hydropower Plant

Venue: Nay Pyi Taw

Date: September, 2017

Chipwi Nge Hydropower Plant, Power Purchase Agreement

Table of Contents

Chapter 1 Definitions and interpretation.....5
Chapter 2 Warranty and representation.....8
Chapter 3 Obligations.....9
Chapter 4 Dispatch of Electrical Power and Energy.....10
Chapter 5 Purchase and Sale of Electrical Energy.....11
Chapter 6 Transaction Price.....16
Chapter 7 Metering of Electrical Energy.....16
Chapter 8 Calculation of Electrical Energy Amount.....17
Chapter 9 Settlement and Payment.....19
Chapter 10 Force Majeure.....23
Chapter 11 Renegotiation.....23
Chapter 12 Unplanned Outages.....23
Chapter 13 Defaults and Remedies.....24
Chapter 14 Effectiveness and term.....24
Chapter 15 Governing laws.....24
Chapter 16 Change, assignment and termination.....24
Chapter 17 Settlement of Disputes.....25
Chapter 18 Miscellaneous.....26
Appendix 1: Main Technical Parameters of power plant.....29
Appendix 2: Main technical parameters of power grid.....32



THIS POWER PURCHASE AGREEMENT (hereinafter referred to as "the Agreement") is hereby made and entered into on ၂၁th September, 2017 in Nay Pyi Taw, the Republic of the Union of Myanmar by:

THE PARTY A: Electric Power Generation Enterprise (hereinafter referred to as "EPGE" or "Party A", a legal enterprise in charge of electric power generation under the government of the Republic of the Union of Myanmar with its registered office at Office No. 27, Nay Pyi Taw, and represented by Managing Director, U Khin Maung Win of the one part;

And

THE PARTY B: Chipwi Nge Hydropower Co., Ltd. (hereinafter referred to as the "CNHC" or "Party B"), a Sino-Myanmar joint venture company formed according to the laws of the People's Republic of China and the Republic of the Union of Myanmar, and a power producer with legal person qualifications with its registered office at S (217/219) Thapyaygone, Zabu Thiri Township, Naypyitaw, Myanmar, and represented by Managing Director, Mr Zhao Laipu of the other part.

The Parties provided the following information for communication and banking purpose:

Name of Party A : Electric Power Generation Enterprise

Attention : Managing Director E-mail: hpgemd@moep.gov.mm

Address : Office No. 27, Nay Pyi Taw

Tel : 95-67-8104290 Fax: 95-67-8104291

Beneficiary Name : Ministry of Electricity and Energy, Electric Power Generation Enterprise

Name of Bank : Myanma Foreign Trade Bank

Swift Code : MFTB MMMY

Name of Party B : **Chipwi Nge Hydropower Co, Ltd.**

Attention : Managing Director E-mail: zhaolaipu@spic.com.cn

Tel : +86871-65660008, 0095-67-8108355

Fax : +86871-65660000, 0095-67-8108399

Address : S(217/219) Thapyaygone, Zabu Thiri Township, Naypyitaw

Account Name : Upstream Ayeyawady Confluence Basin Hydropower Co., Ltd.

Name of Bank : Myanma Economic Bank (Nay Pyi Taw)

Account Number: CU 000065

Whereas:

(1) The Agreement is executed between Party A and Party B for the purpose of the execution of purchasing the electrical energy from Chipwi Nge Hydropower Plant. The 2-PPA/2017 agreement means the 2nd Power Purchase Agreement for FY 2017-2018 by and between Electric Power Generation Enterprise (EPGE) and Chipwi Nge Hydropower Co., Ltd.

(2) Party B has constructed and operated Chipwi Nge Hydropower Plant (hereinafter referred to as "the Power Plant") with a total installed capacity of 99 MW located in the Northern Kachin State, the Republic of the Union of Myanmar;

(3) Three (3) power generating units of the Power Plant of Party B have been connected with the power grid operated and managed by Party A;

(4) The Power Plant does not provide any free-charge electric power so as to effectively reduce the tariff of the electric power transmitted to the Myanmar Grid.

In accordance with the Myanmar Companies Act, Electricity Law, other relevant laws and regulations of the Republic of the Union of Myanmar, the Parties agree to sign this Agreement in the principle of equity, self-willingness, honesty and creditworthiness after adequate negotiations.

Chapter 1 Definitions and interpretation

1.1 The terms and expressions in this Agreement are defined as following unless otherwise specified in the context herein:

1.1.1 Joint Venture Agreement refers to the Joint Venture Agreement signed on 20, January 2015 by the Department of Electric Power Planning (DEPP) under the Ministry of Electric Power (MOEP), and CPI Yunnan International Power Investment Co., Ltd. (CPIYN), and Asia World Company Limited (AWC) for the establishment of CNHC.

1.1.2 EPGE refers to the Electric Power Generation Enterprise, under the Ministry of Electricity and Energy, the Republic of the Union of Myanmar, a legal enterprise duly constituted under the laws of the Republic of the Union of Myanmar and in charge of power generation in the Republic of the Union of Myanmar, having its address at Office No. 27, Nay Pyi Taw, the Republic of the Union of Myanmar.

1.1.3 DEPP refers to the Department of Electric Power Planning, under the Ministry of Electricity and Energy, the Republic of the Union of Myanmar, a legal body duly constituted under the laws of the Republic of the Union of Myanmar and having its administrative Office at building No. 6, Nay Pyi Taw, the Republic of the Union of Myanmar.

1.1.4 CPIYN refers to CPI Yunnan International Power Investment Co., Ltd. a limited liability company incorporated and existing under the laws of the People's Republic of China, with its registered office at No. 1302, Dianchi Road, Kunming, Yunnan Province, P.R. China; Post Code: 650228.

1.1.5 AWC refers to Asia World Company Limited, a limited liability company invested and incorporated and existing under the laws of the Republic of the Union of Myanmar, with its legal representative being U Htun Myint Naing, and its

registered office at No. 61/62 Bahosi Development, Wardan Street, Yangon, the Republic of the Union of Myanmar.

1.1.6 Power Plant refers to the power generation facilities with a total installed capacity of 99MW (including three units respectively with the No. of 1, 2 and 3, and each has a capacity of 33MW) including all the ancillary facilities extending to the boundary of property rights, constructed, operated and managed by Party B in the Chipwi Township, Kachin State in the Republic of the Union of Myanmar.

1.1.7 Unit(s) Available for Dispatch refers to the power generating unit(s) connected to the power grid of Party A and available for the dispatch of Party A within the effectiveness period of this Agreement.

1.1.8 Output Available for Dispatch refers to the Power Plant output which can be produced from the units available for Party A's dispatch for power generation within the effectiveness period of this Agreement.

1.1.9 Planned Contracted Electrical Energy refers to the amount of electrical energy to be purchased by Party A from Party B according to the provision Clause 5.1 of this Agreement.

1.1.10 Electrical Energy Actually Transmitted to Power Grid refers to the amount of electrical energy transmitted to Party A by Party B at the metering point.

1.1.11 Purchase Amount of Electrical Energy refers to the purchase amount of electrical energy defined in Clauses 5.6 and 8.3.1 in this Agreement.

1.1.12 Planned Outage refers to the status of generating unit(s) under scheduled maintenance period including overhaul, repairs required by Party B, scheduled common system maintenance, and maintenance required by Party A on public holidays and festivals, and defects elimination during off-peak hours.

1.1.13 Unplanned Outages refers to the status of generating unit(s) of the Power Plant under unavailable condition but not a Planned Outage.

1.1.14 Equivalent Availability Factor refers to the ratio of available hours of generating units minus equivalent outage hours of reduced output of generating units and the hours of statistical period. As for this Agreement, the equivalent

availability factor of Units No. 1-3 is planned as 70% for the years with overhauls and 85% for non- overhaul years.

1.1.15 Party A's Default refers to the circumstances due to Party A's requirements or responsibilities, including Party A's failure to follow the relevant regulations and codes, which lead to the extended accident and shall be held accountable.

1.1.16 Party B's Default refers to the circumstances due to Party B's requirements or responsibilities, including Party B's failure to follow the relevant regulations and codes, which lead to the extended accident and shall be held accountable.

1.1.17 Metering Points refer to the points at which electrical energy metering devices are installed and to be determined at the power plant by both Parties.

1.1.18 Technical Parameters refer to the technical limitations of power facilities (including power plant equipment, interconnection facilities and Myanmar power grid) as described in Appendix 1 and 2.

1.1.19 Working Day refers to the Gregorian calendar days except statutory public holidays and weekends. If the agreed payment day is not a working day, then the payment day shall be postponed to the subsequent working day accordingly.

1.1.20 Rainy Season refers to the period from June to November in the current year.

1.1.21 Dry Season refers to the periods from January to May and December in the current year.

1.1.22 Force Majeure refers to an event or a circumstance which cannot be foreseen, avoided and overcome, including but not limited to volcanic activity, tornado, hurricane, tsunami, snowstorm, rainstorm, debris flow, landslide, flood, fire, war, earthquake exceeding the design standard, typhoon, thunderstorm, fog flash, nuclear radiation, epidemics, commotion, strikes, acts of terrorists, man-made damage to power generating equipments and facilities of 66 kV and above 66 kV power transmission line.

1.1.23 Laws and Regulations means all of the Republic of the Union of the Myanmar including legislations, statutes, acts, ordinances, rules, orders, regulations, codes, directives, announcements and any other legally binding

pronouncements of any Myanmar governmental authority from time to time in force and effect.

1.2 Interpretation

1.2.1 The headings in this Agreement shall be only for the convenience of reading and shall by no means affect the interpretation of this Agreement.

1.2.2 The Appendixes hereof shall have same legal force as the main body text.

1.2.3 This Agreement is binding upon any party's legal successors or assignees unless otherwise agreed by the parties. If such situation happens, the relevant obligors shall perform the necessary obligation to notice and full legal procedures according to the laws.

1.2.4 Unless otherwise specified in the context, the year, month and day mentioned in this Agreement all refer to those of Gregorian calendar.

1.2.5 The term "including" herein means including but not limited to.

Chapter 2 Warranty and representation

Both Parties warrant and represent that:

2.1 The Parties are a legally established and existing company or organization, entitled to sign and enter into this Agreement.

2.2 All procedures (including clearance of necessary governmental approvals, business license and electrical power operation permit) required for signing and performing this Agreement of the Parties have been done properly and legally effective.

2.3 No courts, arbitration organizations, administrative agencies or regulatory agencies have made any major unfavorable decisions, awards, ruling or specific administrative actions at the time of signing this Agreement.

2.4 All internal authorization procedures required by the Parties for signing this Agreement have been duly completed. Signatory of this Agreement is the Parties' legal representative or commissioned agent. This Agreement becomes binding legally on each party once it comes into force.

Chapter 3 Obligations

3.1 Party A's obligations shall include:

3.1.1 Absorb the amount of electrical energy from the generating units of Party B's Power Plant according to this Agreement. In order to ensure the safe and stable operation of Party B's Power Plant in the long time period, and to maintain the equipments in sound operating conditions, Party A shall not arrange the operations of the generating units exceeding the power generating parameter limits presented in Appendix 1.

3.1.2 Responsible for managing the operation, maintenance and technical upgrade of relevant equipment and facilities under its own power grid and meet the requirements for normal operation of the Power Plant.

3.1.3 Responsible for maintaining its own power grid and meet the technical parameters and conditions for stable operation of the respective generating units, including the parameters listed in Appendix 2.

3.1.4 Properly schedule the equipment maintenance of the Power Plant.

3.1.5 Support and coordinate with Party B for the technical upgrade or parameter adjustment on the respective equipment of the Power Plant.

3.1.6 Conduct the power dispatch and information disclosure in an open, just and fair way. Provide power consumption load demand, reserve capacity, operation status of power transmission and distribution facilities and other relevant information for performing this Agreement.

3.1.7 Party A shall assist Party B in formulating the dispatching plan for Chipwi Nge Hydropower Plant, and implement such dispatching plan.

3.1.8 Party A shall install additional equipment whenever it is necessary to improve the reliability of power grid operations, according to its changes in situation so as to avoid the possible damages to equipment of the Power Plant. Party B understands that fulfillment of this requirement by Party A will need adequate time.

3.2 Party B's obligations shall include:

3.2.1 In accordance with this Agreement, supply Party A with electrical energy in compliance with the standards of Myanmar electric power sector.

3.2.2 Subject to the provision in Clause 4, subordinate to the dispatch of Party A, operate and maintain the Power Plant in compliance with the power sector standards and dispatch code.

3.2.3 Provide Party A with relevant information and indicators of the generating units and equipment operation as required by Party A on monthly basis, as well as the situation of equipment defects in a timely manner.

3.2.4 Provide periodical maintenance plans of the generating units of Power Plant on annual basis and implement these plans which are subject to Party A's coordination, arrangement and balance, and which are determined by Party A and Party B through negotiation.

3.2.5 Conduct timely technical upgrade or parameter adjustment according to the needs and report to Party A for its own record (those relevant to the safety of power grid require Party A's consent).

3.2.6 Receive the electrical power from the Myanmar Power Gird and synchronize at Chipwi Nge Power station if the generating of the Party B's Power Plant is still in full speed no load condition after the system blackout.

3.2.7 Formulate the dispatching plan for Chipwi Nge Hydropower Plant and discuss with Party A so as to jointly determine the term of such plan.

Chapter 4 Dispatch of Electrical Power and Energy

4.1 Power Generating and Dispatching Plan

4.1.1 Party A shall submit the daily power utilization plan of next month by the 22nd day of each month to Party B according to the situation of transmission and distribution facilities and load requirement for next month.

4.1.2 Party B shall prepare and submit to Party A the final power generation plan of

next month by the 25th day of each month according to the period of Planned Outages of Party B's generating units, daily power utilization plan submitted by Party A and forecast of inflow for next month.

4.2 Real-time dispatch

4.2.1 The actual dispatch will be conducted by Party A under the principle of amicable discussion and ensure the generating units of Party B are operated within the safe zone to favor the safe and stable operation of Myanmar Power Grid.

4.2.2 Party B shall, as far as possible, arrange Party A's requirement as to the supply of electric power which does not include in the dispatch plan, subject to the safe and stable operation of the Power Plant.

4.2.3 With exception of emergency, each Party shall notify the other Party before it decreases or increase the load, or changes the operating conditions of its equipment, or makes other operation which may be relevant to the safe and stable operation of Party B's Power Plant and Myanmar Power Grid.

4.2.4 National Control Center (NCC) at Nay Pyi Taw and Load Dispatching Centre (LDC) at Yangon of Myanmar Power Grid will present Party A for real-time dispatch. Party B should follow time to time the dispatching instruction given to Chipwi Nge hydro power plant by NCC or LDC of Myanmar Power Grid directly or via Winemaw substation.

Chapter 5 Purchase and Sale of Electrical Energy

5.1 Amount of Annual Planned Contracted Electrical Energy

Party A shall report, before November 30th of each year, its power consumption plan (referring to Party A's electrical energy demand from Party B's Power Plant, including the amount of monthly Contracted Electrical Energy purchase) for next year to Party B.

Amount of Planned Contracted Electrical Energy to be transmitted to power grid during April, 2017 to March, 2018 will be as follow:

Planned Contracted Electrical Energy from April 2017 to March 2018

Unit in GWh

(1)	(2)	(3)
Year	Month	Planned Contracted Electrical Energy
2017	April	15.60
	May	13.80
	June	15.60
	July	15.00
	August	15.60
	September	15.00
	October	15.60
	November	15.60
	December	15.00
2018	January	15.60
	February	15.00
	March	15.60
Total		183.00

Note: Short purchase and short generation of electrical energy shall be calculated based on column (3).

5.2 Permissible Deviations of Actual Power

During any time period, the range of permissible deviations between actual power generated by the Power Plant and the power determined from the daily generation dispatch plan curve (including temporary adjustment curve) shall be +/-10%. On emergency condition, if NCC or LDC of Myanmar Power Grid asks for more or less generation than the specified deviations value, the power station shall try its best to do.

5.3 Actual Amount of Electrical Energy Transmitted to Power Grid

The actual amount of electrical energy transmitted to power grid in each month is the sum of the amount of electrical energy generated each month from the output of generating units within the permissible deviations specified in Clause 5.2 and the

amount of electrical energy generated each month from the output outside the permissible deviations specified in Clause 5.2 due to Party A's default, plus the amount of electrical energy generated each month from the output of generating units at other conditions which conform to the requirement of dispatch orders.

5.4 Under-generation due to defaults

In any time period, if the generating unit(s) of Party B's Power Plant generates outside the range of its permissible deviations due to Party A's default, the amount of electrical energy resulting from the under-generation shall be treated as Party A's amount of short-purchase outside its plans.

5.5 Metering and measurement of Short-purchased electrical energy due to defaults

5.5.1 Amount of short-purchased electrical energy due to Party A's default in rainy season

Although it is regulated in this Agreement that the consumption ratio of Planned Contracted Electrical Energy in rainy season shall be no less than 60%, Party A shall make effort to increase the consumption ratio in rainy season.

During the rainy season, if due to Party A's default, the amount of actual electrical energy purchase in that month is lower than 60% of the amount of Planned Contracted Electrical Energy for that month, then the difference between the amount of actual electrical energy purchase and 60% of the amount of Planned Contracted Electrical Energy shall be accrued as the amount of short-purchased electrical energy in the rainy season. Party A shall pay compensation money to Party B for the amount of short-purchased electrical energy due to Party A's default in rainy season according to the following formulas:

$$Q_{d1} \begin{cases} = 0 & \text{if } Q_f + Q_{dB} \geq Q_C \times 60\% \\ = Q_C \times 60\% - (Q_f + Q_{dB}) & \text{if } Q_f + Q_{dB} < Q_C \times 60\% \end{cases}$$

Where:

Q_{d1} = Amount of monthly short-purchased electrical energy in rainy season months due to Party A's default

Q_{dB} = Amount of short generated electrical energy caused by Party B

Q_f = Amount of monthly electrical energy actually transmitted to the power grid

Q_c = Amount of monthly Planned Contracted Electrical Energy

5.5.2 Amount of short-purchased electrical energy due to Party A's default in dry season

Although it is regulated in this Agreement that the consumption ratio of Planned Contracted Electrical Energy in dry season shall be no less than 80 %, Party A shall make effort to increase the consumption ratio in dry season.

During the dry season, if due to Party A's default, the amount of actual electrical energy purchase in that month is lower than 80% of the amount of Planned Contracted Electrical Energy for that month, then the difference between the amount of actual electrical energy purchase and 80% of the amount of Planned Contracted Electrical Energy shall be accrued as the amount of short-purchased electrical energy in the dry season. Party A shall pay compensation money to Party B for the amount of short-purchased electrical energy due to Party A's default in dry season according to the following formulas:

$$Q_a \begin{cases} =0 & \text{if } Q_f + Q_{dB} \geq Q_C \times 80\% \\ = Q_C \times 80\% - (Q_f + Q_{dB}) & \text{if } Q_f + Q_{dB} < Q_C \times 80\% \end{cases}$$

Where:

Q_a = Amount of monthly short-purchased electrical energy in dry season months due to Party A's default

Q_{dB} = Amount of short generated electrical energy caused by Party B

Q_f = Amount of monthly electrical energy actually transmitted to the power grid

Q_c = Amount of monthly Planned Contracted Electrical Energy

5.5.3 Amount of short-generated electrical energy due to Party B's default in dry season

The amount of short-generated electrical energy in dry season due to Party B's default should be considered and compensated to Party A. If the amount of actual electrical energy purchase in that month is lower than 80% of the amount of Planned Contracted Electrical Energy for that month, then the difference shall be accrued as the amount of short-generated electrical energy in dry season due to Party B's default. The following formula shall be applied.

$$Q_{d2} \begin{cases} =0 & \text{if } Q_f + Q_{dA} \geq Q_C \times 80\% \\ = Q_C \times 80\% - (Q_f + Q_{dA}) & \text{if } Q_f + Q_{dA} < Q_C \times 80\% \end{cases}$$

Where:

Q_{d2} = Amount of monthly short-generated electrical energy in dry season due to Party B's default

Q_{dA} = Amount of short generated electrical energy caused by Party A

Q_f = Amount of monthly electrical energy actually transmitted to the power grid

Q_c = Amount of monthly Planned Contracted Electrical Energy

5.6 Relief Events

Both Parties have agreed from the period of April, 2017 to the last day of the month of signing of this agreement, there have no under purchase of under generate between the Party A and Party B concerning the transmitted energy of the Metering Point as mentioned in clause 7.1.1, Party A shall be settled to Party B with transaction price of Clause 6.1.

Chapter 6 Transaction Price

6.1 Transaction price

6.1.1 After friendly negotiation by Party A and Party B, both parties have agreed from 1st, April, 2017 to 31st March, 2018, the transaction price for electricity purchased by Party A from Party B shall be RMB 0.375 Yuan per kWh. If RMB is available, the power charges shall be settled and paid in RMB; otherwise the power charges shall be settled and paid in Myanmar Kyats equivalent to RMB 0.375 based on the exchange rate at the Central Bank of Myanmar on the settlement day.

Chapter 7 Metering of Electrical Energy

7.1 Metering points

7.1.1 Both parties have agreed from 1st April, 2017 to 31st March, 2018, 110 kV Myitsone-Winemaw Transmission Line's meter that is located at the Power Plant shall be defined as the Metering Point. Electricity energy transmitted to power grid and drawn from power grid for the Power Plant shall be calculated by using of the recorded data from this Metering Point.

7.2 Electrical energy metering devices and relevant equipment

7.2.1 Accuracy of electrical power energy metering devices is required to be 0.2S level at 110 kV outgoing side.

7.2.2 The installation of electrical power energy metering devices shall be completed in accordance with the requirements under Party B's responsibilities before the interconnection of the Power Plant with the power grid. Joint acceptance shall be carried out by Party A and Party B before the devices are put into operation in conjunction with the testing of channel, protocol and system between electrical energy data acquisition terminals.

7.2.3 Main and back-up electrical energy meters of same type, specifications and accuracy level shall be installed one set each at the same metering point. The Main and back-up electrical energy meters shall be marked explicitly.

7.2.4 The electrical energy metering devices for interconnection with power grid shall be purchased, paid, installed and tested by Party B, and the day-to-day management and maintenance shall be under Party B's responsibility as well.

7.3 Calibration of electrical energy metering devices

7.3.1 Trouble shooting and periodical calibration of electrical energy metering devices shall be undertaken by an inspection and testing agency for electrical energy meter and measurement, which is confirmed by Party A and Party B. The expenses incurred shall be paid by Party B.

7.3.2 Either Party may require at any time the calibration or tests to be carried out on the electrical energy metering devices other than the periodical calibration. The calibration or tests shall be done by an inspection and testing agency for electrical energy meter and measurement, which is confirmed by Party A and Party B. The expenses incurred shall be paid by Party B

7.4 Handling of metering abnormalities

When abnormality or trouble is found on the electrical energy metering devices by either Party A or Party B of this Agreement and the metering of electrical energy is affected, the counterpart Party and the meter inspection and testing agency acceptable by Party A and Party B shall be notified immediately for joint trouble shooting and restore the normal metering operation as early as possible.

If it is necessary to replace the electrical energy metering device with a new one, all the cost incurred shall be paid by Party B.

Chapter 8 Calculation of Electrical Energy Amount

8.1 The amount of electrical energy transmitted to power grid or the amount of electrical energy feedback from power grid shall be settled in monthly interval and require daily documentation and reporting, monthly settlement and annual clearance of all accounts. Party A and Party B shall calculate the electrical energy based on the electrical energy data recorded from the electrical energy meters at the metering points on the last day of said month at 24:00 hour local time and confirmed jointly by Party A and Party B.

8.2 Recording of electrical energy data for settlement

8.2.1 Under normal circumstance, Party A and Party B shall take the electrical energy data recorded from main electrical energy meters as the basis for settlement, the data from the back-up meters are to be used to verify the data from the main meters or to substitute the main meters in case of fault on the main meters or out of service due to whatever reason.

8.2.2 On-site recording of electrical energy data for settlement

Before the remote terminals of Party A's electrical energy system is put into operation, use the FREEZE function of the electrical energy meter for setting the metering reading at 24:00 hour according to Clause 8.1 as the meter-recording data, and the staff from Party A and Party B shall agree to record meter readings on site the following day.

8.3 Calculation of electrical energy

8.3.1 Electrical energy transmitted to power grid

Electrical energy transmitted to power grid refers to the accumulative amount of all electrical energy (positive direction) recorded at the metering points according to Clause 7.1 and transmitted from the generating units of Party B's Power Plant to Party A. Actual transmitted electrical energy volume will be calculated by both parties such as electrical energy volume recorded from metering point minus electrical energy volume recorded from Myitsone Substation.

8.3.2 Electrical energy feedback from power grid

Electrical energy feedback from power grid refers to the electrical energy transmitted from power grid to the Power Plant when the generating units are completely shut down. It is defined as the accumulative amount of all input electrical energy (negative direction) recorded at the metering points according to Clause 7.1.

8.4 The amount of electrical energy transmitted to power grid and the amount of electrical energy feedback from power grid shall be settled separately at the same price.

Chapter 9 Settlement and Payment

9.1 Calculation of Electrical Energy Charges

9.1.1 Both parties have agreed from 1st April, 2017 to 31st March, 2018, Party A shall be settled to Party B month by month, the actual electricity energy amount recorded from the metering point and transaction price as mentioned in clause 7.1 and 6.1 respectively.

9.1.2 The charges for electrical energy shall be settled according to the following formula:

Charges for electrical energy settlement, compensation money for short-purchased electrical energy due to Party A's defaults in rainy season and in dry season and compensation money for short-generated electrical energy due to Party B's defaults in dry season shall be calculated by multiplying the corresponding amount of electrical energy with the transaction price stated in Chapter 6.

$M_b = Q_b \times P$

$M_d = Q_{d1} \times P$

$M_a = Q_a \times P$

$M_s = Q_{d2} \times P$

Where:

M_b= Charges for power purchase

Q_b= Amount of monthly electrical energy purchase as defined in Clause 5.6 and 8.3.1.

P= Transaction price

M_d= Compensation money for short-purchased electrical energy due to Party A's defaults in rainy season

Q_{d1}= Amount of short-purchased electrical energy due to Party A's defaults in rainy season

M_a= Compensation money for short-purchased electrical energy due to Party A's defaults in dry season

Q_a = Amount of short-purchased electrical energy due to Party A's defaults in dry season

M_s= Compensation money for short-generated electrical energy due to Party B's defaults in dry season

Q_{d2}= Amount of monthly short-generated electrical energy due to Party B's default in dry season

The compensation money for the electrical energy due to defaults shall be deemed as one part of the charges for electrical energy settlement, but it shall be cleared at the last month of the effective term hereof according to the following formulas:

$M_{C1} = M_b + M_d$

$M_{C2} = M_b + M_a - M_s$

Where:

M_{C1} = Monthly charges for electrical energy settlement in rainy season

M_{C2} = Monthly charges for electrical energy settlement in dry season

M_a = Compensation money for short-purchased electrical energy due to Party A's defaults in dry season

M_b = Charges for power purchase

M_d = Compensation money for short-purchased electrical energy due to Party A's defaults in rainy season

M_s = Compensation money for short-generated electrical energy due to Party B's defaults in dry season

9.2 Settlement of Electrical Energy Charges and Payment

9.2.1 After the meter readings have been recorded by Party A and Party B according to Clause 8.2, Party B shall accurately calculate the amount of electrical energy transmitted to power grid and the corresponding electrical energy charges according

to the recorded meter readings. Party B shall prepare the Settlement Statement for Electrical Energy and Calculation Sheet for Electrical Energy Charges and fax them to Party A within three working days. The originals shall be sent out by an express courier on the same day.

9.2.2 Party A shall promptly verify and confirm the Settlement Statement for Electrical Energy and Calculation Sheet for Electrical Energy Charges transmitted from Party B. If there is any different opinion, Party A shall notify Party B within 3 working days after the fax is received. After the revision is made by the Parties through negotiation, Party B shall fax the revised Settlement Statement for Electrical Energy and Calculation Sheet for Electrical Energy Charges to Party A with the originals sent out by an express courier on the same day. If Party A does not notify Party B its disagreement within 3 working days after fax is received, it shall be deemed as confirmed by Party A and no disagreement.

9.2.3 Party B shall issue and deliver the invoice to Party A according to the Calculation Sheet for Electrical Energy Charges which are duly confirmed by Party A. Party A shall make the full payment for the Electrical Energy charges of the said billing period within 6 weeks after the correct original Settlement Statement for Electrical Energy, Calculation Sheet for Electrical Energy Charges and invoice are received.

Party B understands Party A's approval procedure required for obtaining the foreign exchange permit, a deviation within +/-10% is acceptable for the electrical energy charges paid by Party A for each month. However, the part of underpaid amount for the current month shall be fully paid in the next month. If Party A fails to pay off its power charges according to the agreed deadline, starting from the overdue date, a late fee for the relevant late payment amount shall be levied at a daily rate of 0.02%.

9.3 Payment for Electrical Energy Charges adjusted from Metering Errors

In case of metering errors, if Party A is required to make additional payment to Party B, or if Party B is required to refund Party A, the accounts shall be cleared in the settlement of electrical energy charges in subsequent month after the agreement

in writing is reached by Party A and Party B.

9.4 Payment of Electrical Energy Feedback from Power Grid

For the amount of electrical energy feedback from power grid and used by the Power Plant which is calculated according to Clause 8.3.2 of this Agreement, the charges shall be accounted at the transaction price of the power plant with the power grid and shall be paid by Party B to Party A within 6 weeks.

9.5 Method of Payment

Any money payable by Party A to Party B according to this Agreement shall be remitted directly into the bank account provided by Party B in this Agreement. After Party B notifies Party A of change of bank or of account number, it shall be remitted into the changed bank account accordingly. The payment shall be deemed as completed only after Party B receives the moneys at the designated bank account.

9.6 Data and records

Party A and Party B agree to keep the original data and records on its own and shall make them available for the inspection of statements and records within the reasonable scope according to this Agreement, or for the examination and verification of calculation accuracy.

9.7 Settlement of Compensation Money

9.7.1 The compensation money for short-purchased electrical energy, lower than 60 % in rainy season due to Party A's default according to Clause 5.5.1 and the compensation money for short-purchased electrical energy, lower than 80 % in dry season due to Party A's default according to Clause 5.5.2, which are calculated as described formula in related Clause after negotiation by both parties, shall be cleared and settled in the last month of the effective term hereof.

9.7.2 The compensation money for short-generated electrical energy, lower than 80 % in dry season due to party B's default according to Clause 5.5.3, which are calculated as described formula after negotiation by both parties, shall be cleared and settled in the last month of the effective term hereof.

Chapter 10 Force Majeure

10.1 If either Party is temporarily rendered unable, wholly or in part, by Force Majeure to perform its duties or accept performance by the other Party under this contract, it is agreed that the effected Party gives notice to the other Party within (14) fourteen days after the occurrence of the cause relied upon giving full particulars in writing of such Force Majeure. The duties of such Party as are effected by such Force Majeure shall with the approval of the other Party, be suspended during the continuance of the inability so caused, but for no longer period, and such cause shall as far as possible be removed with all reasonable dispatch. Neither Party shall be responsible for delay, damage or loss caused by Force Majeure.

Chapter 11 Renegotiation

11.1 In the event that any situation or condition arises due to circumstances not envisaged in the Agreement warrants amendments to the Agreement, the Parties shall make the necessary negotiations for the conclusion and execution of the Agreement.

Chapter 12 Unplanned Outages

12.1 As agreed by Party A and Party B, the accumulative allowable value of equivalent unplanned outages for each generating unit of the Power Plant connected with Myanmar power grid due to Party B's default shall be 720 hours for that year. If the actual accumulative hours of equivalent unplanned outage of the generating units of the Power Plant in that year due to Party B's cause are greater than the allowable value for that year, the calculated electrical energy as a result of the installed capacity of the generating units multiplied by the Equivalent Availability Factor and the number of exceeded hours shall be deducted from the electrical energy for settlement for the last month in the effective term hereof.

12.2 As agreed by Party A and Party B, the accumulative allowable value of equivalent unplanned outages of each generating unit of the Power Plant connected with Myanmar power grid due to Party A's default shall be 720 hours for that year. If the actual accumulative hours of equivalent unplanned outage of the generating

units of the Power Plant in that year due to Party A's default are greater than the allowable value for that year, the calculated electrical energy as a result of the installed capacity of the generating units multiplied by the Equivalent Availability Factor and the number of exceeded outage hours shall be counted as the electrical energy transmitted to power grid in the last month of the effective term hereof.

Chapter 13 Defaults and Remedies

13.1 Violation of the clauses of this Agreement by either Party shall be deemed as default, and the other Party shall be entitled to require the default Party to compensate its economic losses resulting from the act of default.

13.2 In case of the default, the non-default Party shall immediately notify the default Party to stop its act of default and send a written notice to the default Party as soon as possible requiring the correction of its act of default. The default Party shall immediately take measures to correct its act of default, confirm its default.

13.3 Before the expiration of the performance term prescribed in this Agreement, either Party expresses explicitly or expresses by its own behavior not to perform its obligations of the Agreement, the other Party can require the non performing Party to bear its liability of default.

Chapter 14 Effectiveness and term

14.1 After signing of this agreement by representatives of both parties, it shall become immediately effective through out to March 31st of 2018.This Agreement shall be expired on March 31st, 2018.

14.2 Three month before the expiration of the term of this agreement, the Parties shall negotiate on the matters relevant to the renewal of this Agreement.

Chapter 15 Governing laws

15.1 This Agreement shall be governed by and construed and interpreted in all respects in accordance with the laws of the Republic of the Union of Myanmar.

Chapter 16 Change, assignment and termination

16.1 Any alteration, change, modification, and supplement to this Agreement shall

be done by mutually agreed upon written consent of the Parties. The condition for the effectiveness shall be the same with Clause 14.1.

16.2 Party A and Party B express explicitly that no Party shall have the right to transfer all or part of the rights or obligations under this Agreement to any third party without the written consent of the other Party.

16.3 Termination

This Agreement may be terminated upon the occurrence of one of the following conditions:

(a) Breach of terms and conditions of Agreement by one of the Parties;

(b) Occurrence of Force Majeure;

(c) Incapability of implementing the original aims and objects of the enterprise;

(d) By mutual consent of both Parties with a serving of a 30 day notice by either Party;

(e) Bankruptcy and liquidation of one Party;

(f) One Party merges with another party or transfers all of, or majority of its assets to another entity, and the existing enterprise is unable to afford all its obligations under this Agreement;

(g) Due to Party B's default with the exception of Force Majeure, all generating units of the Power Plant are simultaneously unable to generate and deliver power for a period of 30 consecutive days according to this Agreement.

Chapter 17 Settlement of Disputes

17.1 If the conflict, dispute or claim of the Parties cannot be settled amicably by consultation, the Agreement on Encouragement, Promotion and Protection of Investment between the Government of the People's Republic of China and the Government of the Republic of the Union of Myanmar shall apply. In case the issue remains to be settled, it shall be settled by arbitration. The arbitration proceedings shall be in accordance with the provisions of the UNCITRAL Rules. The venue of arbitration shall be Yangon, Myanmar and the language of arbitration shall be

English. Costs of arbitration shall be borne by the losing Party.

Chapter 18 Miscellaneous

18.1 Confidentiality

The Parties guarantee to treat as secret and confidential the data and documents obtained from the other Party which are not available from the public domains. The other Party shall not disclose entire or part of the data and documents to any third party without the consent of the original provider of those data and documents.

18.2 Appendixes

Appendix 1: Main technical parameters of power plant

Appendix 2: Main technical parameters of power grid

The appendixes shall be the integral part of this Agreement and have the same legal force. In case any difference between the interpretations of this Agreement and appendixes, it shall be determined firstly according to the nature of issue in dispute, and by the contents most relevant and deeper representative to the dispute point. If the difference and contradiction is still present after the above principles have been adopted, the Parties shall negotiate in good faith for the settlement according to the objective of this Agreement.

18.3 Entirety

This Agreement, together with the appendixes thereto, sets forth the entire agreement for accomplishing the object of this Agreement, and supersedes in all respects all previous discussions, negotiations, agreements and contracts between the Parties for this Agreement.

18.4 Notice and delivery

Any notice, document, bill and other communication relevant to this Agreement shall be given in writing. It shall be deemed to have been received after the addressee has signed and accepted if transmitted by registered mail, express courier or personally; and if transmitted by fax, at the time received by the addressee thereof. All the notices, documents, bills and other communications shall become

effective only after they have been transmitted or received. All the notices, bills, data or documents and other communications shall be transmitted to the addresses provided in this Agreement. In case one Party advises the other Party the change of address in writing, it shall be transmitted to the changed address.

Name of Party A	: Electric Power Generation Enterprise
Attention	: Managing Director
Address	: Office No. 27, Nay Pyi Taw
E-mail	: hpgemd@moep.gov.mm
Tel	: 95-67-8104290 Fax: 95-67-8104292
Cc	: Chief Engineer
Tel	: 95-67-8104265 Fax: 95-67-8104269
Name of Party B	: Chipwi Nge Hydropower Co., Ltd.
Attention	: Managing Director
Address	: S(217/219)Thapyaygone, ZabuThiri Township, Naypyitaw
E-mail	: zhaolaipu@spic.com.cn
Tel	: +86871-65660008, 0095-67-8108355
Fax	: +86871-65660000, 0095-67-8108399

Done in Two originals and each Party shall hold One originals in Nay Pyi Taw, the Republic of the Union of Myanmar on 21th September, 2017 in the English language.

In WITNESS WHEREOF the parties hereto have set their hands and affixed their seals on the day, month and year first above written. Signed, sealed and delivered by:

For and on behalf of:
Electric Power Generation Enterprise

For and on behalf of:
Chipwi Nge Hydropower Co. Ltd.

Khin Maung Win
Managing Director
Electric Power Generation Enterprise
Ministry of Electricity and Energy

ZHAO LAIPU
MANAGING DIRECTOR
CHIPWI NGE HYDROPOWER CO., LTD.

In the presence of

Dr. Maung Maung Kyaw
Chief Engineer
Electric Power Generation Enterprise

JIANG YU
CHIEF FINANCIAL OFFICER
CHIPWI NGE HYDROPOWER CO.,LTD.

Aye Aye Mon
General Manager
Electric Power Generation Enterprise

LI WEN
DIRECTOR
CHIPWI NGE HYDROPOWER CO.,LTD.

Appendix 1: Main Technical Parameters of power plant

Sr. No.	Designations	Unit	Quantity	Remarks
A	**Hydrological parameters**			
1	Drainage area upstream of dam site	km^2	552.3	
2	Typical flow			
	Average annual flow	m^3 /s	40.1	
	Design flood standard and flow (p=2%)	m^3 /s	1710	
	Check flood standard and flow (p=0.2%)	m^3 /s	2540	
B	**Reservoir parameters**			
1	Reservoir water level			
	Check flood water level (p=0.2%)	M	745.99	
	Design flood water level (p=2%)	M	744.26	
	Normal supply water level	M	740	
	Dead water level	M	735	
2	Volume of reservoir			
	Total reservoir volume	10^4m^3	123.4	
	Regulation reservoir volume	10^4m^3	28.1	
	Dead reservoir volume	10^4m^3	78.9	
3	Characteristics of regulation			

Sr. No.	Designations	Unit	Quantity	Remarks
C	**Power generation parameter**			
1	Installed capacity	MW	3*33	
2	Firm output	MW	25.9	
3	Average annual power output	10^4kW·h	59860	
4	Single unit safe & stable operating zone	MW	4-33	
D	**Interconnection Parameters**			
	Connecting with 110kV system			
	System nominal voltage level	kV	110	
	Equipment maximum high voltage	kV	126	
	Numbers of phase and frequency	Hz	3Φ, 50Hz	
	Short time power frequency withstand voltage	kV(rms)	230	
	Lightning impulse withstand voltage	kV(peak)	550	
	Method of neutral grounding		direct grounding	
E	**Main Technical Parameters of Generator**			
	Number of units	Nos	3	
	model		SF33-16/4500	
	rated capacity	kVA	38823.5	
	power rating	kW	33000	
	rated voltage	V	10500	

Sr. No.	Designations	Unit	Quantity	Remarks
	rated current	A	2134.7	
	Frequency	HZ	50	
	power factor		0.85 (lagging)	
	rated field voltage	V	201	
	rated field current	A	690	
	rated speed	r/min	375	
	runaway speed	r/min	685	
	No load excitation voltage	V	76	
	No load excitation current	A	380	
F	**Technical Parameters of Main Transformer**			
	Number of units	Nos	3	
	model		SF10-40000/121	
	rated capacity	kVA	40000	
	rated voltage	kV	121/10.5	
	rated current	A	190.9/ 2199.4	
	rated frequency	Hz	50	
	short circuit impedance		10.77	
	top oil temperature rise	K	44.7	

Appendix 2: Main technical parameters of power grid

No.	Description	Unit	Quantity	Remarks
1	System voltage	kV	132	Range of allowable fluctuation +/-10%。
2	System frequency	Hz	50	Range of allowable fluctuation 48-52。

Arial View of Chipwi Nge HPP



Arial View of Dam



Arial View of Living Campus



Dam



Dam



Reservoir



Power House



Transmission System







Gate of Power House



Inside the Power House



Inside the Power House



Inside the Power House



Central Control Room



Central Control Room



Living Campus



Operation



Maintenance



Training



Line Patrol



Road in the Chipwi Township which Built by the Company



Attachment 1: Explanation of non-commercial nature to commercial nature of Chipwi Nge HPP

Attachment 2: Company registration certificate

Attachment 3: National registration card and passport

Attachment 4: Promoter's profile

Attachment 5: JV agreement

Attachment 6: Deed of assignment

Attachment 7: Detailed list of machinery and equipment

Attachment 8: Detailed list of main raw materials

Attachment 9: Land ownership evidences

Attachment 10: Recruitment of employees

Attachment 11: Social security and welfare program

Attachment 12: Financial evaluation

Attachment 13: Environmental Impact Report of Chipwi Nge HPP

Attachment 14: Power Purchase Agreement

Attachment 15：Pictures of Chipwi Nge HPP